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CLIMATE SECURITY THREAT - AMERICA'S ACHILLES' HEEL?

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CLIMATE SECURITY THREAT—AMERICA'S ACHILLES' HEEL?

by

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December 2018

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The 2015 National Security Strategy warns that natural hazards supercharged by the effects of climate change pose a direct threat to the human and national security of the United States. This thesis asks if the U.S. government is placing the American public at risk by failing to create resilience standards appropriate to the threats posed by natural hazards, including hazards that will be exacerbated by climate change. What is preventing the nation from understanding the risk of climate security threats and the need to adapt to those threats? What lessons can the United States learn from our allies to establish an effective climate change adaptation protocol? These questions are examined through four emergency management considerations: the climate threat, presidential narratives, emergency management laws and relevant policies, and democratic allies' climate adaptation progress. The research shows that decisive national leadership toward climate adaptation is urgently needed in the United States. The answers to these research questions provide a narrow view of key factors that can be changed to achieve a more resilient nation and increase public safety for the American people.

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CLIMATE SECURITY THREAT—AMERICA'S ACHILLES' HEEL?

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ABSTRACT

The 2015 National Security Strategy warns that natural hazards supercharged by the effects of climate change pose a direct threat to the human and national security of the United States. This thesis asks if the U.S. government is placing the American public at risk by failing to create resilience standards appropriate to the threats posed by natural hazards, including hazards that will be exacerbated by climate change. What is preventing the nation from understanding the risk of climate security threats and the need to adapt to those threats? What lessons can the United States learn from our allies to establish an effective climate change adaptation protocol? These questions are examined through four emergency management considerations: the climate threat, presidential narratives, emergency management laws and relevant policies, and democratic allies' climate adaptation progress. The research shows that decisive national leadership toward climate adaptation is urgently needed in the United States. The answers to these research questions provide a narrow view of key factors that can be changed to achieve a more resilient nation and increase public safety for the American people.

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LIST OF ACRONYMS AND ABBREVIATIONS

CO_2	carbon dioxide
CRS	Congressional Research Service
DCRA	Department of Climate, Research, and Adaptation
DoD	Department of Defense
DHS	Department of Homeland Security
EU	European Union
FEMA	Federal Emergency Management Agency
FFRMS	Federal Food Risk Management Standard
GAO	Government Accountability Office
IPCC	Intergovernmental Panel on Climate Change (United Nations)
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
ppm	parts per million
UNFCCC	United Nations Framework Convention on Climate Change
USDA	United States Department of Agriculture
USGCRP	U.S. Global Change Research Program
USGS	United States Geological Survey

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EXECUTIVE SUMMARY

The United States of America has a real problem with climate change. While the concept of climate change may be straightforward, the problems associated with its causes and effects, remedies, and necessary adaptations are incredibly complex. Today, climate change has become a deeply controversial topic despite scientific consensus on its origins and its looming catastrophic threat.

Alarming as it is globally, climate change has also been recognized as a threat to the national security of the United States. Is the U.S. government fulfilling its obligation to ensure the "safety and security of the American people" by creating resilience standards that adequately guard against this known and growing threat?[1] This thesis examines the factors that are preventing the nation from understanding and adapting to climate security threats by exploring the intersection between climate security and emergency management. Federal, state, and local emergency management is concerned with the safety of the public before, during, and after disasters. Framed by qualitative literature on the climate threat itself, this thesis examines how presidential narratives have affected sustainable leadership on climate change action, the effect of public policy that supports climate adaptation, and how adaptation measures in the United States compare to our global allies such as Canada and the European Union.

The effects of climate change are already surfacing, and unchecked emissions (pollutants) spell an increasing prediction for catastrophic global impacts. Today, intense storms and heat waves are rare. However, predictive modeling shows a grim future for many regions: extensive, persisting droughts; heatwaves that force the land to absorb ever more heat, creating intolerable temperatures for humans and livestock; intensified rainstorms that drop incredible amounts of water in short periods of time; and more frequent and destructive storm systems. The result will be forced migration from impacted areas around the world, reduced quantity and quality of sustainable food crops,

[1] Department of Homeland Security, *The 2014 Quadrennial Homeland Security Review* (Washington, DC: DHS, 2014), 8, https://www.dhs.gov/sites/default/files/publications/2014-qhsr-final-508.pdf.

undependable fresh water resources, and higher temperatures that will change growing seasons and modify pestilence and disease. And these are only some of the known implications of climate-induced weather extremes.

Climate change is included in numerous national threat analyses from the Department of Defense, the Director of National Intelligence, the Department of Homeland Security, and the National Intelligence Council. However, presidential narratives over the past few decades have shown great power to shape public discussion and policy implications about climate change. Federal agencies exist to implement public policy that is dependent upon laws, regulations, and executive directives. Since the emergency management community is most interested in safety, this thesis briefly examines the laws that guide emergency management grants and the use of minimum standards. Land use and building codes are particularly critical to this discussion, yet these areas of public policy are not keeping up with current public safety needs, much less with the future impacts of climate change. Additionally, there is very little public discourse about the known risks of climate change, even though severe weather events are becoming more frequent and intense. Still, the United States does not have a national climate adaptation policy that drives federal guidance.

Canada shares many climate-related threats with the United States, as well as some historical presidential narratives. However, Canada is approaching these threats proactively; the country is encouraging discourse across its territories—addressing challenges unique to each area—and actively promoting climate adaptation activities. The European Union also has many geologic, geographic, and meteorological similarities with the United States. However, membership in the European Union is voluntary; the EU laws that govern climate adaptation are codified by law through membership, which creates willingness to achieve progress.

Through research and analysis, the thesis concludes that the United States is not doing enough to protect the public from the effects of climate change—not just the direct impacts, but also the cascading consequences from those impacts over time. For example, melting glaciers in the Antarctic and Greenland may have no bearing on weather in the United States; over time, however, these melting ancient waters will affect the salinity,

density, temperature, currents, and volume of seas around the Earth. Consequently, the sea level in downtown Miami and the City of New York will rise on a daily basis—not just at high tide. The laws governing emergency management are not adequate to improve resilience in the face of this threat, and do not promote risk consciousness to climate security. Furthermore, there are no federal laws or regulations governing local land use or building code regulations; the guidance that does exist does not require decision-makers to use recent disaster data to improve their recommendations. After a disaster, the federal government—or the American taxpayer—pays to rebuild public infrastructure to pre-disaster condition, reinforcing an unending cycle of risk. This is a significant gap in accountability.

The United States has long embodied the fortitude and discipline that is synonymous with global leadership. But the most important lesson we can learn from our allies is to embrace a systemic policy path toward climate resilience. U.S. leadership at the federal level has avoided taking any such path. Using transparent scientific evidence, we must adopt a risk-based decision-making culture of preparedness. Climate change and its impacts have stymied this great nation. The American public, in its right for representation as the leader of democracy around the world, should expect—should demand—more to protect our children and all future generations.

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I. INTRODUCTION

> [T]here's one issue that will define the contours of this century more dramatically than any other, and that is the urgent and growing threat of a changing climate.
>
> —U.S. President Barack Obama ,
> UN Climate Change Summit, September 23, 2014[1]

Important centers of authority in the U.S. government squarely recognize climate change as a security threat to the United States and its interests.[2] Natural hazards supercharged by the effects of climate change pose a direct threat to human and national security, and intensified climate impacts—combined with persistent infrastructure decline—is increasing U.S. vulnerability to more catastrophic and complex disasters.[3] Despite scientific consensus, political divisiveness about climate change continues to enable this persistently growing and destabilizing threat.[4] Although nations around the world are creating resilience to increasingly life-threatening and property-destroying events, the United States has not maintained a forward-looking climate change adaptation philosophy or sustainable climate resilience doctrine.[5]

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1 Barack Obama, "Remarks by the President at U.N. Climate Change Summit," White House, September 23, 2014, https://obamawhitehouse.archives.gov/the-press-office/2014/09/23/remarks-president-un-climate-change-summit.

2 President of the United States, *National Security Strategy* (Washington, DC: White House, 2015), 12, http://nssarchive.us/wp-content/uploads/2015/02/2015.pdf; Department of Defense (DoD), "National Security Implications of Climate-Related Risks and a Changing Climate," RefID 8-6475571 (report, Department of Defense, May 2015), http://archive.defense.gov/pubs/150724-congressional-report-on-national-implications-of-climate-change.pdf?source=govdelivery; "National Climate Assessment 2014," U.S. Global Change Research Program, accessed September 20, 2017, http://nca2014.globalchange.gov/report; Department of Homeland Security, *The 2014 Quadrennial Homeland Security Review* (Washington, DC: DHS, 2014), 22, https://www.dhs.gov/sites/default/files/publications/2014-qhsr-final-508.pdf.

3 Aris Papadopoulos, *Resilience: The Ultimate Sustainability* (Miami, FL: Resilience Action Fund, 2016), 26–29.

4 Cary Funk and Brian Kennedy, "The Politics of Climate," Pew Research Center, October 4, 2016, http://www.pewinternet.org/2016/10/04/the-politics-of-climate/.

5 Richard Youngs, *Climate Change and European Security* (London: Routledge, 2015), 81; CNA Military Advisory Board, *National Security and the Accelerating Risks of Climate Change* (Alexandria, VA: CNA Corporation, 2014); Naomi Klein, *This Changes Everything: Capitalism vs. the Climate* (New York: Simon & Schuster, 2014).

A. RESEARCH QUESTIONS

Sophisticated predictive models illustrate a grim future for the climate into the twenty-second century.[6] Although predicting the timing of future climate change effects is an imprecise science, most governments worldwide are focusing on complex action to backtrack the worst predicted impacts.[7] Models show that weather patterns will be increasingly unpredictable, and that sever events will occur more frequently, at a great cost to society.[8] These changes are expected to disrupt life-sustaining agricultural, hydrological, and biological dependencies as well.[9] With a growing number of natural disasters and their worldwide implications, climate change is not simply a threat multiplier; soon, it is predicted to drive global instability and war.[10]

Because the climate problem is inherently complex, this thesis only touches on the basic nature behind why there is a climate crisis; it focuses, instead, on the U.S. response to that crisis. Rather than focusing on differences of opinion, the thesis concentrates on the grim reality that adaptation will be necessary, and examines three core U.S. government considerations toward a climate-resilient future:

1. Is the U.S. government placing the American public at risk by failing to create resilience standards appropriate to the threats posed by natural hazards, including hazards that will be exacerbated by climate change?

2. What is preventing the nation from understanding the risk of climate security threats, and the need to adapt to those threats?

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6 Patrick T. Brown and Ken Caldeira, "Greater Future Global Warming Inferred from Earth's Recent Energy Budget," *Nature* 552 (December 2017), https://www.nature.com/articles/nature24672.

7 Gwynne Dyer, *Climate Wars* (Oxford, UK: Oneworld Publications, 2011), 85–96.

8 Al Gore, *An Inconvenient Sequel: Truth to Power* (New York: Rodale, 2017), 311.

9 National Research Council, *A Safer Future: Reducing the Impacts of Natural Disasters* (Washington, DC: National Academies Press, 1991), 21, https://www.nap.edu/read/1840/chapter/6; USGCRP, "National Climate Assessment," sec. "Our Changing Climate."

10 USGCRP, "National Climate Assessment," sec. "Widespread Impacts"; Office of the Assistant Secretary of Defense (Energy, Installations & Environment), *Department of Defense 2014 Climate Change Adaptation Roadmap* (Washington, DC: Department of Defense, 2014), https://www.acq.osd.mil/eie/downloads/CCARprint_wForward_e.pdf; CNA *Risks of Climate Change*.

3. What lessons can the United States learn from our allies to establish an effective climate change adaptation protocol?

B. RESEARCH DESIGN

The research design for this thesis is a qualitative literature review. As the initial research began, four primary factors emerged; these factors are the qualitative lens through which this thesis was developed: 1) the climate threat, 2) the impact of presidential narratives on sustainable U.S. doctrine, 3) laws and regulatory mechanisms guiding emergency management and resilience, and 4) global attempts to address climate threats.

Chapter II reviews literature that reveals four factors that affect climate change adaptation in the United States. It begins with credible U.S. government documents and other knowledgeable sources on the climate threat itself. Chapter III discusses the climate threat to the homeland and extrapolates the threat's potential consequences through the twenty-first century. It focuses on key sectors and presents a comprehensive foundation that explains why the climate phenomenon is perceived by numerous security professionals as a threat to national security.

Much of the climate research in Chapter III is derived from key U.S. departments and agencies that are responsible for homeland security. Because much data is derived from federal agencies, it is also linked to the Executive Office of the President of the United States. Chapter IV broadly discusses the national narrative about climate issues since the 1970s, as led by presidential administrations. The chapter explores the administrations' climate ideologies and their effects on national dialogue, continuity, and basic leadership for the American public.

Chapter V demonstrates how presidential narratives have influenced climate-related laws, regulations, and policies for federal agencies. Agencies implement new programs—and often change existing programs—with states, territories, tribes, and the American people through each administration. These are the tools through which doctrine becomes tangible. Despite the systemic checks and balances built into U.S. democracy, presidential doctrine can significantly influence public perception. Climate change itself is

an example of a national challenge that cannot maintain a consistent framework for action or resolution due to changing narratives from the Office of the President.

Chapter VI compares the United States' position on climate adaptation to the European Union and Canada. The United States has forged significant global agreements toward reversing the drivers of climate change and illuminating the importance of adaptation. Despite prominent international leadership on global matters following World War II, U.S. dogma has been inconsistent on climate change adaptation.[11] In the absence of U.S. leadership on climate adaptation, this thesis explores climate adaptation progress in important democratic first-world allies.

Chapter VII synthesizes the national security considerations of climate change, the laws and policies pertaining to climate adaptation and disasters, and the prospect of U.S. globalism versus nationalism to answer the research questions. While Chapter VII draws conclusions about national security considerations and regulations, Chapter VIII provides recommendations based on the overall findings in this thesis and suggestions for future research opportunities.

11 Ian Bremmer, "The Era of American Global Leadership Is Over," *TIME*, December 19, 2016, http://time.com/4606071/american-global-leadership-is-over/.

II. LITERATURE REVIEW

We need a Marshall Plan for the Earth.

—Naomi Klein[12]

This literature review is categorized by the four methodological filters for national security introduced in the previous chapter: the climate threat, presidential narratives, emergency management laws and relevant policies, and democratic allies' climate adaptation progress. The research begins with governmental and independent sources that identify and contextualize the climate threat. A discussion of presidential narratives is followed by emergency management laws, as well as other regulations and policies that affect disaster management and resiliency. The fourth filter is a broad review of U.S. foreign allies and their challenges with climate adaptation. The literature review culminates with informative resources that help analyze the threat to national security.

There is copious literature on the topic of climate change. Researching the specific topic of thesis was arduous; it required sorting critically through mass amounts of government publications, books, journals, and internet resources. Each presidential administration's climate change philosophy was researched independently; the research became more specific when the problem was no longer a new scientific phenomenon, following the Reagan administration. National security publications reflect presidential narratives to varying degrees. The emergency management link to the national security threat of climate change is under-researched, especially as it connects to relevant doctrine governing policies.

Climate adaptation is also explored through programs in other democratic first-world countries. Although scholarly material is available on this topic, it is difficult to find and most of it is online. Because the research questions are topics of growing relevance and are much politicized, internet research is an important source for current news.

12 Klein, *This Changes Everything*, 5.

Furthermore, the research questions for this thesis are not static; the dialogue on the U.S. approach to climate change is constantly evolving.

Although many resources were consulted in the development of this thesis, only the most fundamental are included in this short literature review. Other quality material from knowledgeable experts is included throughout the following chapters to demonstrate the credibility of the information and to support the reporting of past events.

A. THE CLIMATE THREAT

In *Climate Wars*, Gwynne Dyer writes a sobering account of the status of the world through the mid-twenty-first century.[13] He describes climate change triggers, time horizons, political tensions, survival, and the long view of how deeply complex the climate problem is for the Earth and all its inhabitants. The book goes beyond a simple explanation of climate science, describing critical metrics and why they matter. He discusses relevant issues of global energy, fossil fuels, and the economic implications of action or inaction, along with the importance of global and U.S. food production and commodities resourcing as the world's population continues to expand.

Joshua Busby's treatise *Climate Change and National Security*, written in 2007 as a report for the Council on Foreign Relations, explains, significantly, why these two issues are a combined concern.[14] In his report, Busby captures the criticality that climate change threats are for the future. In the post–Hurricane Katrina era, Busby crystalizes that the climate threat has only just begun. The report argues the scale of the threat is not matched with adequate domestic policy or programs to secure the United States from the predicted escalation of future climate events. The report critically assesses global impacts, squarely placing humanitarian instability, government destabilization, and increased terrorism as important concerns for U.S. national security.

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13 Dyer, *Climate Wars*.

14 Joshua W. Busby, *Climate Change and National Security: An Agenda for Action*, CSR No. 32 (New York: Council of Foreign Relations, 2007), http://i.cfr.org/content/publications/attachments/Climate Change_CSR32.pdf.

A decade later, many of Busby's U.S. domestic and foreign policy assessments remain relevant. Busby calls for action on rising sea levels in high-risk coastal areas; he recommends creating an international military conference to set the tone for collaboration and information sharing; and, addressing infrastructure gaps, he recommends systemic mitigation and resilience integrated into both domestic and foreign policy. He challenges the status quo, claiming that fundamental change to existing climate governance is necessary, and he recommends creating senior-level advisors in the Office of the President, the National Security Council, and the Pentagon, as well as implementing Congressional oversight. These insights were partially realized during the Obama administration (2009–2017), and provide guideposts for defining climate change as a national security threat.

The first issue of the Department of Homeland Security (DHS) *Quadrennial Homeland Security Review* (published in 2010) includes climate change as an impending national security threat.[15] At that time, national security continued to be influenced by a post-9/11 military defensive posture, or threat of domestic asymmetric warfare. The inclusion of climate change in the inaugural issue acknowledges the threat of natural hazards and pandemics to national security. The review states that climate change will intensify weather hazards and potentially instigate instability, war, and humanitarian crises, resulting in large movements of people. DHS further acknowledges this risk through its mission, which is built on five foundations—one of which disaster resilience. A sign of the times, the dialogue in the 2010 review filters this concept first through the prism of terrorism, but calls out disasters as a catch-all for intentional or unintentional domestic harm. This document stands with other significant government publications released through 2017 that connect the threat of climate change to national security, many of which are referenced in this thesis.

In 2014, the third National Climate Assessment, a product of the U.S. Global Change Research Program (USGCRP), was released to the public.[16] The digital publication

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15 DHS, *Quadrennial Homeland Security Review Report: A Strategic Framework for a Secure Homeland* (Washington, DC: DHS, 2010). https://www.dhs.gov/xlibrary/assets/qhsr_report.pdf.

16 USGCRP, "National Climate Assessment."

is a summary of the state of the climate, assembled by hundreds of panel experts and studiously peer reviewed under the umbrella of the U.S. federal government. Recalling Busby's insight once again, the USGCRP was placed in the Office of the President, which gave significant lift to the program's prestige. The report itself is a public-facing, online publication that describes the reasons behind and status of the global climate; it is broken down into five U.S. regions and interpreted for economic and social implications, and also gives recommendations for adaptation and mitigation actions. This report is significant because it shows wide federal support to coalesce state-of-the-art science. Its goal is making a complex topic easily digestible, enabling the public to understand the climate threat. The report uses plain language about the threats, their current effects, and future predictions. The website is an important source of current climate science.

Peace Prize Nobel Lauriat and former Vice President of the United States Al Gore has written several books on climate change. In his most recent book, *An Inconvenient Sequel: Truth to Power*, Gore clearly explains the global threat climate change presents to all of humanity—indeed, life on Earth.[17] He describes the climate's potential to change weather in frightening future consequences, yet paints a hopeful outlook for humanity. He is optimistic that the human race can and will embrace his reality and act strategically to combat the most damaging effects for future generations. Gore illustrates this outlook through stories about renewable energy, and about communities that have benefited from new jobs and businesses. He discusses technological advancement that allow surplus energy to be stored for future use. Easily half of the book is dedicated to public engagement. He encourages education, activism, and commitment. His depth of understanding and summation of the core problem in simple terms is useful for this thesis; it captures the essence of a humanity faced with daunting challenges, but with hope for a positive outcome.

17 Gore, *An Inconvenient Sequel*.

B. PRESIDENTIAL ADMINISTRATIONS AND THE NATIONAL NARRATIVE

Amy Royden, a Harvard Law graduate and climate advocate, captures the principles of the William J. (Bill) Clinton administration on climate change in her 2002 article, "U.S. Climate Change Policy under President Clinton: A Look Back."[18] She initially gives a brief snapshot of the two previous administrations' (Reagan, 1981–1989, and Bush, 1989–1993) environmental postures to platform the Clinton era. Royden considers Clinton's choice of Al Gore—a known environmentalist—for vice president a clear, early statement of the Clinton administration's future policies. Dissecting the Clinton administration's climate change narrative, Royden recounts key policy decisions and strategies, including the "Climate Change Action Plan" released within ten months of the new administration's inauguration. Her comprehensive account of the administration's deliberative intent to define a national dialogue on climate change provides balance to this thesis by sequencing the general mood during the administration, and why decisions in the following administration were so counter-intuitive at the time.

Unfortunately, there is little officially archived material available about climate change or adaptation from the George W. Bush administration. However, the "Global Climate Change Policy Book" was released by the Bush White House in 2002.[19] In its opening statement, the policy document reveals its premise: that economic prosperity will drive innovation and new technology, and the climate problem requires multi-generational solutions. The policy specifically calls for investments in climate and energy research; these initiatives, the document says, will help reveal fresh solutions that will take generations to address climate change.

Armin Rosencranz, a Stanford University law professor, wrote a review of key climate-related developments during the Bush administration.[20] Rosencranz is critical of

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18 Amy Royden, "U.S. Climate Change Policy under President Clinton: A Look Back," *Golden Gate University Law Review* 32, no. 4 (2002), http://digitalcommons.law.ggu.edu/ggulrev/vol32/iss4/3.

19 "Global Climate Change Policy Book," White House, February 2002, https://georgewbush-whitehouse.archives.gov/news/releases/2002/02/climatechange.html.

20 Armin Rosencranz, "U.S. Climate Change Policy under G.W. Bush," *Golden Gate University Law Review*, 32, no. 4 (2002), http://digitalcommons.law.ggu.edu/ggulrev/vol32/iss4/4.

the administration's rejection of the Kyoto Protocol, a pioneering global climate change agreement crafted in large part by the Clinton administration, soon after his inauguration. Rosencranz claims this was a declarative position that would remain throughout Bush's presidency, and he discusses pre-existing disagreements between U.S. and European Union (EU) policy that strongly influenced Bush's position on U.S. action. Rosencranz discusses the justification of the Kyoto abandonment, which he believes set an important precedent for U.S. climate policy—one that continues to be a cornerstone of opposition to U.S. participation in global agreements to this day.

In June 2013, President Barack Obama issued *The President's Climate Action Plan*.[21] It clearly outlines a comprehensive path forward for the nation to address climate change and its predicted impacts. Three primary objectives of the plan were to reduce fossil fuel emissions, create more awareness of climate change impact and take steps toward climate adaptation, and engage U.S. leadership on global climate change solutions. The plan addresses various sectors, including fuel economy, clean energy, and energy efficiency, and discusses moderating toxic gases released into the atmosphere. Also included is discussion about infrastructure investments, and government-provided climate science to further advance state, tribal, and local leadership awareness. These goals set the nation on a collective course toward implementation of climate change policy.

Early in the Donald J. Trump administration (2017), scholarly material on an official climate policy is unavailable. That is not to say, however, that digital information is lacking; Trump's opinions during his candidacy—and his official actions as a new president—were relayed in tweets. Indeed, there is a huge amount of discussion by special interests about the pros and cons of an unofficial Trump climate policy. Columbia Law School designed and maintains the Climate Deregulation Tracker, which records any climate regulations that Trump changes or eliminates.[22] Outside of the declaration of an

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21 Executive Office of the President, *The President's Climate Action Plan* (Washington, DC: White House, June 2013), https://obamawhitehouse.archives.gov/sites/default/files/image/president27sclimateactionplan.pdf.

22 "Climate Deregulation Tracker," Columbia Law School, accessed September 8, 2017, http://columbiaclimatelaw.com/resources/climate-deregulation-tracker/all-updates/.

official climate policy, this website specifically records Trump's official actions on climate policy as president. One of the most significant documents of the Trump presidency is the issuance of Executive Order 13783, *Promoting Energy Independence and Economic Growth*.[23] This order effectively reversed many of the Obama-era climate change adaptation actions, including rescinding—not superseding—*The President's Climate Action Plan*.

C. REGULATIONS, LAWS, AND POLICY

Federal policies, laws, and regulations can be complex, and sometimes contradictory. Laws can be newly created in response to standing policy for major disasters that require federal assistance, to allow more flexibility. In 2017, the Congressional Research Service published *Federal Disaster Assistance Response and Recovery Programs: Brief Summaries* to give an up-to-date snapshot of relevant disaster policy.[24] This document recaps programs offered by the Federal Emergency Management Agency (FEMA) and other agencies that were triggered by disaster declaration. While this report addresses emergency laws, regulations, and policy for disaster assistance, it does not address non-disaster topics that have an effect on resiliency.

Disasters in the United States was published in 2017 and jointly written by Vera Brusentsev and Wayne Vroman.[25] It provides a comprehensive look at the frequency and cost of disasters in the United States today. The book covers federal assistance programs as well as public- and private-sector insurance, and culminates by examining how disasters affect American job markets, and their overall economic impact in the United States. While the climate threat section of this book is relevant to this thesis, even more so are its discussions about the threat's cost to the nation, and what it means to national security.

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23 Donald J. Trump, *Promoting Energy Independence and Economic Growth*, Executive Order 13783 (Washington, DC: White House, March 2017, https://www.whitehouse.gov/the-press-office/2017/03/28/presidential-executive-order-promoting-energy-independence-and-economi-1.

24 Maria Kreiser, Maura Mullins, and Jared C. Nagel, *Federal Disaster Assistance Response and Recovery Programs: Brief Summaries*, CRS Report No. RL31734 (Washington, DC: Congressional Research Service, 2017), https://fas.org/sgp/crs/homesec/RL31734.pdf.

25 Vera Brusentsev and Wayne Vroman, *Disasters in the United States* (Kalamazoo, MI: WE Upjohn Institute, 2017).

Aris Papadopoulos is a passionate resilience advocate who studied engineering at the Massachusetts Institute of Technology (MIT), and business at Harvard University.[26] In his book, *Resilience: The Ultimate Sustainability*, he clearly takes aim at the building industry. His thesis is that critical fundamentals driving building policy in the United States are subpar, and greatly contribute to the reason the country faces substantial disaster losses. The book—which is well-researched and contains numerous comparative statistics—offers a behind-the-scenes view of the economic drivers that keep the building code system largely unregulated; it reveals deep vulnerabilities in the U.S. housing system, caused by an emphasis on cost savings, that are largely unaddressed in the public eye. A 2016 Government Accountability Office (GAO) report recommended that building code standards and designs committees consult climate experts when determining code standards.[27] This report, requested by Congress, queries the sources that inform final code standards and recommendations. The investigators found that there is little cross-collaboration with federal agencies to effectively determine if the codes and standards are sufficient to meet today's climate threats.

In "Historical Overview of the American Land Use System," Pace University law professor John R. Nolan contributes to this discussion about U.S. communities' vulnerabilities.[28] Nolan provides an in-depth look into the federal, state, and local governments' roles in determining land use; governmental involvement is a core element of resilient design for local communities—from business sectors to housing—when considering natural hazards. Nolan's work illustrates, however, that federal and state oversight allow little local control, and little accountability, which contributes to the communities' vulnerabilities when natural hazards occur.

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26 Papadopoulos, *Resilience*.

27 Government Accountability Office (GAO), *Climate Change: Improved Federal Coordination Could Facilitate Use of Forward-Looking Climate Information in Design Standards, Building Codes, and Certifications*, GAO-17-3 (Washington, DC: GAO, 2016), x, https://www.gao.gov/assets/690/681300.pdf.

28 John R. Nolon, "Historical Overview of the American Land Use System: A Diagnostic Approach to Evaluating Governmental Land Use Control," *Pace Environmental Law Review* 33, no. 3 (special edition 2006): 821–853, https://digitalcommons.pace.edu/lawfaculty/459/.

D. CLIMATE ADAPTATION IN THE UNITED STATES, EUROPEAN UNION, AND CANADA

According to Cinnamon P. Carlarne, a professor of law and expert in climate change policy, the United States was a strong global frontrunner in climate initiatives under the Clinton administration.[29] However, in the following Bush years, the United States scaled back its involvement in climate initiatives and global coordination. As a result, the European Union emerged as a leader in climate initiatives. Carlarne's book *Climate Change Law and Policy* is full of important historical information that offers detailed accounts from a global perspective. She primarily focuses on the United States and European Union, but intertwines global advancements and setbacks that contributed to U.S. and EU policies.

Richard Youngs, in his book *Climate Change and European Security*, claims the European Union has only recently begun to incorporate climate concerns into its national security dialogue and preparations.[30] Youngs provides a sobering look at the very real security concerns climate change presents and has informed this thesis deeply on the subject. Most international climate programs coordinate on some level with the United Nations Framework Convention on Climate Change (UNFCCC), which has two fundamental activities toward addressing climate change: mitigation and adaptation.[31] The UNFCCC also hosts the Conference of the Parties, whose members form the working committees that develop global agreements, such as the Kyoto Protocol (1997) and the Paris Agreement (2016).

Through the Obama presidency, the United States participated in global strategies to prepare for climate change. In 2013, Obama issued Executive Order 13653, which mandated the first legal requirement for federal agencies to develop and submit climate

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29 Cinnamon P. Carlarne, *Climate Change Law and Policy* (Oxford, UK: Oxford University Press, 2010).

30 Youngs, *Climate Change*.

31 United Nations Climate Change, accessed September 17, 2017, https://unfccc.int/; "Background," United Nations Framework Convention on Climate Change, accessed September 27, 2017, http://unfccc.int/essential_background/items/6031.php.

adaptation plans.[32] These plans—which were only one of several climate actions discussed in the order—were to outline how federal agencies would begin a coordinated effort to prepare for climate instability. This executive order was an attempt to bring adaptation into the U.S. dialogue through action planning not only in the agency's footprint, but through its authorized programs. In 2015, the Congressional Research Service issued a report that provided Congress with a review of the adaptation plans.[33] This analysis provides a helpful view of the government's ability to provide risk analysis for its own agencies, and Congress's role in providing performance metrics.

Today, Canada embraces a climate-friendly approach that encompasses adaptation and climate dialogue. The government of Canada hosts a Federal Adaptation Policy Framework for Climate Change website, which is available to the public.[34] Canada also demonstrates concern about the sociological and economic impacts of climate change, and various online sources reveal Canada's approach to climate change.[35]

E. ANALYSIS AND CONCLUSION

The threat that climate change poses to U.S. national security was discussed, also, in a 2014 report assembled by a board of advisers consisting of sixteen retired leaders from the armed services.[36] In the report, the board members express forthright concern over inaction from the United States and other nations to address the climate change threat. In *Climatic Cataclysm*, Kurt M. Campbell's collection of essays articulates why foreign

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32 Barack Obama, *Preparing the United States for the Impacts of Climate Change*, Executive Order 13653 (Washington, DC: White House, November 2013), https://www.whitehouse.gov/the-press-office/2013/11/01/executive-order-preparing-united-states-impacts-climate-change.

33 Jane A. Leggett, *Climate Change Adaptation by Federal Agencies: An Analysis of Plans and Issues for Congress*, CRS Report No. R43915 (Washington, DC: Congressional Research Service, 2015), https://fas.org/sgp/crs/misc/R43915.pdf.

34 "Federal Adaptation Policy Framework for Climate Change," Government of Canada, last modified August 12, 2016, https://www.canada.ca/en/environment-climate-change/services/climate-change/federal-adaptation-policy-framework.html.

35 "Adaptation and Climate Resilience," Government of Canada, last modified December 14, 2016, https://www.canada.ca/en/services/environment/weather/climatechange/pan-canadian-framework/adaptation-climate-resilience.html.

36 CNA Military Advisory Board, *Risks of Climate Change*. The original report was published in 2007 by an equally esteemed panel of advisory members.

policy and national security are inseparable components of climate change dialogue.[37] Prominent authors contributed to this book, with a specific eye toward the climate threat to national security; its purpose is to underscore that climate change will be a brutal, persistent, and unabated threat that requires actionable climate policy. Similarly, National Public Radio (NPR) interviewed Michael Masters, a senior vice president at the prominent international security organization The Soufan Group, soon after Hurricane Harvey in September 2017.[38] Martin asserts that natural hazards are a growing threat to national security because they create vulnerability.

In general, the research shows scientific consensus that human activity is causing global warming, resulting in a changing climate and related impacts. NASA's Global Climate Change webpage emphasizes the importance of consensus, referencing scientific establishments that further underscore consensus on the science by independent bodies.[39] The United Nations Intergovernmental Panel on Climate Change (IPCC) is an independent resource that, in some respects, acts as a high-level clearinghouse of historical and emergent data and information.[40] Nations from around the world participate in the IPCC assessment reports, which are published every seven years and contain the latest climate-related information to guide decision-makers on global policy.[41] A highly structured process, material is researched and peer-reviewed under strict protocols by leading scholars and subject-matter professionals.[42] When it comes to consensus, the IPCC has achieved unanimous agreement by its authors on all assessments released to date. Thus, it is the true benchmark.

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37 Kurt M. Campbell, *Climatic Cataclysm* (Washington, DC: Brookings, 2008).

38 Michel Martin, "How Natural Disasters Make Major Cities Vulnerable to National Security Threats," NPR, September 10, 2017, http://www.npr.org/2017/09/10/549989643/how-natural-disasters-make-major-cities-vulnerable-to-national-security-threats.

39 "Scientific Consensus: Earth's Climate Is Warming," NASA, accessed September 15, 2018, https://climate.nasa.gov/scientific-consensus/.

40 Intergovernmental Panel on Climate Change, accessed September 15, 2018, http://www.ipcc.ch/organization/organization.shtml.

41 "The IPCC: Who Are they and Why Do Their Climate Reports Matter?," Union of Concerned Scientists, last updated November 15, 2017, https://www.ucsusa.org/global-warming/science-and-impacts/science/ipcc-backgrounder.html#.W51mpc5Kipo.

42 Intergovernmental Panel on Climate Change.

When it comes to consensus, however, one of the most important recent findings is a peer-reviewed article by James Cook et al. titled "Consensus on Consensus: A Synthesis of Consensus Estimates on Human-Caused Global Warming."[43] Cook's team compiled more than 11,900 research papers from global science scholars, of which 97 percent agreed that the planet is warming due to human civilization. The study sparked considerable commentary, from political proselyting to outright dissent.[44] Despite the 97-percent consensus in Cook et al.'s study, the degree to which the climate is changing—and the timeline of impacts—is another subject for independent study. Future research should investigate how, in an age of science, climate science has become weaponized by opinion—to the point of influencing or stagnating meaningful dialogue—when the risk is so great. Another important avenue for future research is how messaging, especially in an age so saturated by information, influences public perception from climate professionals and political influencers. This exemplifies why an apolitically neutral forum for scientific consensus is necessary.

As identified in this research, climate change has been acknowledged as a threat—at least on some level—by U.S. presidents over the last half-century. As such, there is no identifiable peer-reviewed consensus arguing against it. However, this lack of rigorous academic evidence underscores why opinion and narrative play an important role in the leadership and direction of the United States. Prior to the 2016 presidential election, Donald Trump had espoused the idea that climate change was "created by and for the Chinese in order to make U.S. manufacturing non-competitive."[45] On numerous occasions, Trump

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43 John Cook et al., "Consensus on Consensus: A Synthesis of Consensus Estimates on Human-Caused Global Warming," *Environmental Research Letters* 11, no. 4, (April 2016), http://iopscience.iop.org/article/10.1088/1748-9326/11/4/048002.

44 Earl J. Ritchie, "Fact Checking the Claim of 97% Consensus on Anthropogenic Climate Change," *Forbes*, December 14, 2016, https://www.forbes.com/sites/uhenergy/2016/12/14/fact-checking-the-97-consensus-on-anthropogenic-climate-change/#75c8a44a1157.

45 Donald J. Trump (@realDonaldTrump), "The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive," Twitter, November 6, 2012, 11:15 a.m., https://twitter.com/realDonaldTrump/status/265895292191248385.

used social media to denounce global warming as a "hoax" or "nonsense."[46] When he was elected as the new U.S. president, he continued to espouse this opposing view: when his administration released its first National Security St5rategy in December 2017, the document officially eliminated climate change as a national security threat, sparking significant controversy across major media.[47] Within weeks, 106 members of the House of Representatives signed onto a letter noting the omission and asking the White House to reinsert climate change as a national security threat based on scientific evidence.[48] As of today, the Trump administration's National Security Strategy has not been revised.

There are ample and emergent resources rich with information about climate instability and national security. This thesis explores the connection between the climate change threat and national security, and how it intersects with the emergency management community, in an attempt to find key vulnerabilities that expose the United States to natural disasters, which in turn may complicate the very resilience we are seeking to achieve.

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46 Donald J. Trump (@realDonaldTrump), "Snowing in Texas and Louisiana, record setting freezing temperatures throughout the country and beyond. Global warming is an expensive hoax!," Twitter, January 28, 2014, https://twitter.com/realDonaldTrump/status/428414113463955457; Donald J. Trump (@realDonaldTrump), "Give me clean, beautiful and healthy air – not the same old climate change (global warming) bullshit! I am tired of hearing this nonsense," Twitter, January 28, 2014, 1)44 p.m., https://twitter.com/realDonaldTrump/status/428418323660165120.

47 President of the United States, *National Security Strategy of the United States of America* (Washington, DC: White House: 2017), https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf.

48 James R. Langevin, letter to President Donald J. Trump, January 11, 2018, https://langevin.house.gov/sites/langevin.house.gov/files/documents/01-11-18_Langevin_Stefanik_Letter_to_POTUS_Climate_Change_National_Security_Strategy.pdf.

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III. THE CLIMATE THREAT

> Climate change is a global problem with serious implications, environmental, social, economic, political, and for the distribution of goods; it represents one of the principal challenges facing humanity in our day.
>
> —Pope Francis, Laudato Si, May 24, 2015[49]

Climate change is an expanding threat to civilian and national security interests, stemming from changes to the Earth's physical systems.[50] When overproduced, certain emissions from human society and natural processes alter the Earth's ability to regulate itself in ways familiar to mankind. Today, mainstream science consistently submits that persistent concentration of emissions destabilizes the atmosphere and is not abating effectively enough to stop reactive planetary processes.[51] The increasing emissions are a catalyst for making the Earth hotter. Higher Earth temperatures cause mankind to experience more severe weather and other threats that are progressively violent and unforgiving. Severe weather is occurring with increasing frequency, which is a clear signal that the Earth is approaching a point at which human intervention to reverse the damage is increasingly unattainable.[52] The IPCC calls this a tipping point.[53]

The tipping point occurs when carbon dioxide equivalents (all greenhouse gases) in the atmosphere reach a nexus with the higher temperature of the Earth. When the tipping point is reached, it will trigger catastrophic weather and other consequences that mankind cannot reverse.[54] Think of it as a dew point—when the temperature and humidity reach a certain point, it will rain. In the language of climate change, a tipping point is when the

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49 Catholic Climate Covenant, accessed August 14, 2018, http://www.catholicclimatecovenant.org/.

50 Gore, *An Inconvenient Sequel*, 13.

51 Gore, 42.

52 Rajendra K. Pachauri and Leo Meyer (eds.), *Climate Change 2014: Synthesis Report* (Geneva, Switzerland: IPCC, 2014),77, https://www.ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_FINAL_full.pdf.

53 Pachauri and Meyer, 128.

54 Pachauri and Meyer, 8.

Earth will drive its own intensified outcomes through positive feedback loops.[55] Positive feedback loops are essentially Earth's own cascading reactions to the chemical imbalance on a planetary scale. The following are just a few examples of feedback loops:

- Warm oceans produce abundant evaporation, increasing atmospheric water vapor. When overproduced, water vapor becomes a greenhouse gas because it traps even more heat in the sky, which forces more ocean heating, evaporation, and water vapor. It becomes its own cycle of reinforcement, resulting in more negative impacts to the Earth's weather.

- As the Earth warms, the massive melting of ice sheets and glaciers is problematic because the ice helps to regulate planetary temperatures and other important stabilizing processes. When liquid water replaces the reflective capacity of ice to send heat into space, the open water absorbs over 90 percent of sunlight as heat, thereby sustaining yet another feedback loop to manifest even more heat.[56]

- Melting ice and thawing tundra release incredible amounts of previously frozen methane hydrate into the atmosphere. This gas is twenty-two times more potent than CO_2, and further unleashes massive stores of fossilized CO_2.[57] The Siberian bog, for example, contains 70 billion tons of methane gas and it started melting in 2005.[58]

- Ocean algae, such as kelp, are a biological necessity for life on Earth as they produce huge amounts of oxygen and help regulate ocean acidity.[59] Algae need iron-rich soils blown from land into the seas. Farming methods today interfere with this process. Oceans are converting massive amounts

55 Dyer, *Climate Wars*, 85.

56 Dyer, 86.

57 Dyer, 87.

58 Dyer, 93.

59 Dyer, 87.

of CO_2 into carbonic acid faster than predicted, which erodes a healthy food web.[60] Without a healthy food web, the oceans cannot support simple or complex organisms. Challenged by overfishing for human food supply, ocean acidification illustrates a grim future.

- Oceans are considered by scientists to behave as vast carbon sinks capable of absorbing excess CO_2. Because of the accelerating acidification, the oceans have already exhausted almost fifty percent of their absorption capacity.[61]

Many of these feedback loops are already well underway, along with numerous other climate change manifestations. And, again, these are only a few examples of the implications of increased planetary heat and outcomes pushing the Earth toward the tipping point. In 1988, the IPCC determined the tipping point to be 2 degrees Celsius above pre-industrial times, roughly circa 1800.[62] Pre-industrial carbon dioxide (CO_2) atmospheric concentrations were approximately 280 parts per million (ppm).[63]

This discussion is important because this tipping point (2 degrees Celsius above pre-industrial times) was identified as a global limit after which the feedback loops would become self-propelled on an intractable superhighway to climate Armageddon. James A. Hansen, former director of the Goddard Space Institute at NASA, alarmed Congress when he claimed that the worst effects may be avoidable if global CO_2 concentrations stop at 400 ppm.[64] That was thirty years ago. The IPCC has since raised the ceiling to 450 ppm and changed the global target, with some acceptable planetary impact, to 350 ppm. The thinking goes that the Earth's climate will stabilize around CO_2 concentrations at 350 ppm.

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60 Monica Allen. "Research Shows Ocean Acidification Is Spreading Rapidly in the Arctic," National Oceanic and Atmospheric Administration, March 29, 2017, https://www.climate.gov/news-features/features/research-shows-ocean-acidification-spreading-rapidly-arctic.

61 Dyer, *Climate Wars*, 87.

62 Dyer, 85, 95.

63 Dyer, 95.

64 Dyer, 60

CO_2 concentrations in the atmosphere today are 407 ppm (see Figure 1).[65] Projections indicate that human intervention would require as much as a 90- percent reduction in current levels of CO_2 concentration emissions to cap at 450 ppm by the year 2050.[66] The take-away is alarming.

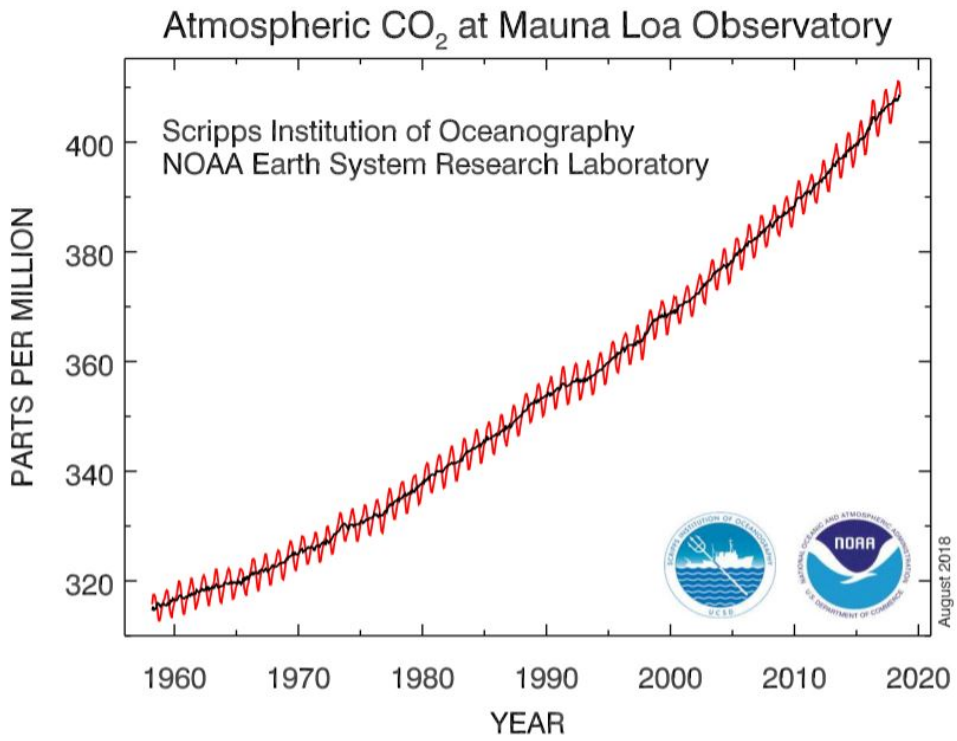

Figure 1. Carbon Dioxide Monthly Measurement[67]

Scientists agree that the climate is responding to higher levels of gases that retain heat in the atmosphere, and their impacts are being felt around the world, as shown in

65 "Vital Signs: Carbon Dioxide," NASA, accessed June 4, 2018, https://climate.nasa.gov/vital-signs/carbon-dioxide/.

66 Dyer, *Climate Wars*,69.

67 Source: "Trends in Atmospheric Carbon Dioxide," NOAA, accessed August 14, 2018, https://www.esrl.noaa.gov/gmd/ccgg/trends/full.html.

Figure 2.[68] Current CO_2 exceeds measurable levels over the past 450,000 years.[69] Climate models through the year 2100 illustrate an alarming picture of unpredictability and harshness that will be quite different from the era of relative climate stability that accompanied the rise of humanity throughout our recorded history.[70] As a result, the intensifying weather is predicted to increase in severity well into the next century, manifested by areas of exceptional drought, longer and more intense periods of extreme heat, rain bombs, hotter and larger wildfires, larger tropical cyclones, severe storms and flooding, including blizzards and ice storms, among other threats.[71] Climate threats are dangerous force-multipliers to existing vulnerabilities.[72]

68 USGCRP, "National Climate Assessment," sec. "Supplemental Message 1."

69 "Graphic: The Relentless Rise of Carbon Dioxide," NASA, accessed June 5, 2018, https://climate.nasa.gov/climate_resources/24/graphic-the-relentless-rise-of-carbon-dioxide/.

70 Gore, *An Inconvenient Sequel*, 36.

71 Gore, 36.

72 Youngs, *Climate Change*, 38.

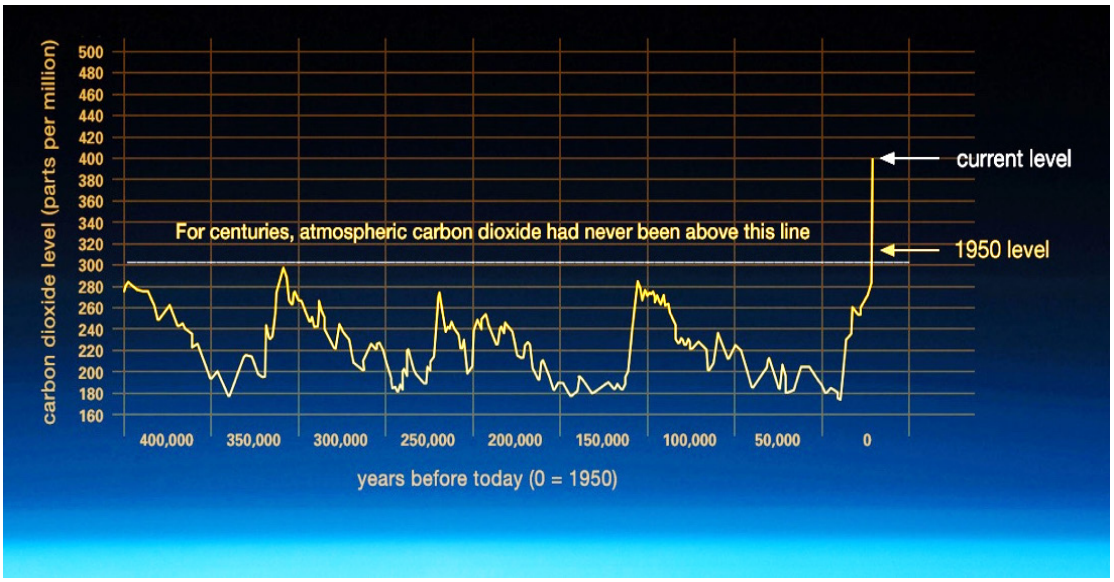

Figure 2. Dramatic Increase of Atmospheric Carbon Dioxide from Ice Core and Direct Atmospheric Measurements since the Industrial Age[73]

The effects of climate change on national security will challenge the emergency management community. Due to the rapid change in risk, science is hard-pressed to provide accurate risk-exposure estimates to leaders and decision–makers.[74] Because observations have been recorded for a long time, the manifestations of climate change can be measured. For instance, the change in average sea level over the past thirty years is attributed to an overall reduction in global ice coverage, as well as seawater expansion from increasing average temperatures (see Figure 3).[75] Changes in sea level have enormous consequences for the built environment on the coast; they increase the threat of flooding and expose entire coastal communities to flood and storm surge hazards.

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73 Source: J.R. Petit et al., "Satellite Data Confirm Annual Carbon Dioxide Minimum above 400 ppm," NASA, January 30, 2017, https://climate.nasa.gov/news/2535/satellite-data-confirm-annual-carbon-dioxide-minimum-above-400-ppm/.

74 USGCRP, "National Climate Assessment," sec. "Supplemental Message 1."

75 Global Climate Change. Vital Signs of the Planet: Sea Level. NASA: Washington, D.C., https://climate.nasa.gov/vital-signs/sea-level/. Accessed 6/5/18.

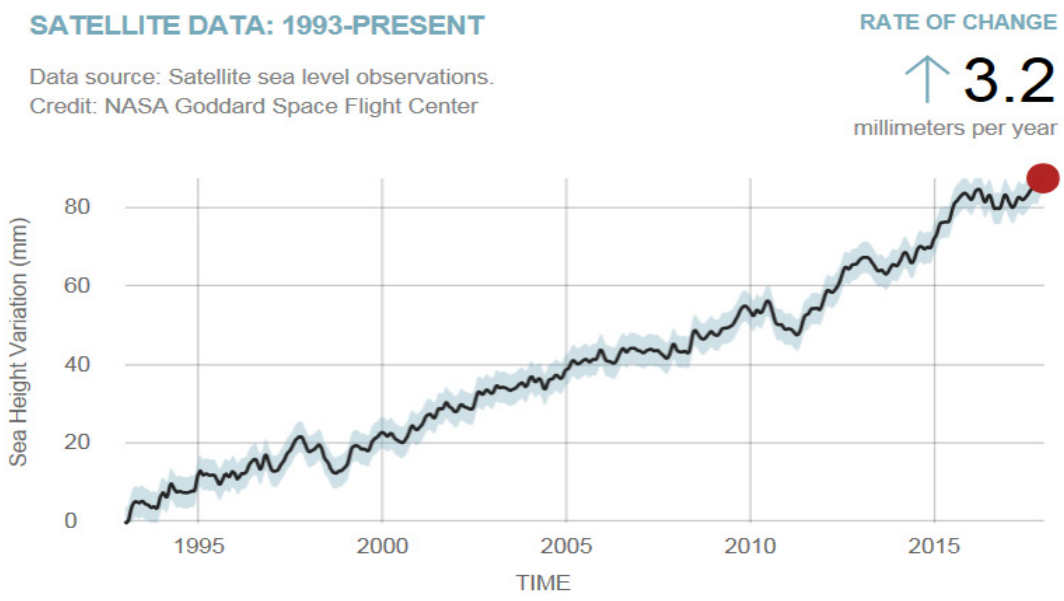

Figure 3. Change in Sea level as Measured by Satellite from 1993 to 2017[76]

The primary impacts of severe weather are immediate. Figure 4 compares the average number of flood days per year in several coastal U.S. cities from 1950 to the 2010s. The data show a dramatic change. As homes are flooded, residents are forced to flee; they may be forced to find safe shelter until damages can be determined, and cleanup and restoration operations render the community safe for return. Temporary housing in an alternate and safe location is difficult for the evacuees and expensive for the federal government. Schools are frequently used as temporary shelters for survivors, which disrupts their primary functions. Roads and bridges may be washed away. Commuters' work and home schedules are disrupted until repairs are completed. Nursing home residents are placed at higher risk of death and complex illnesses from loss of electricity, or the distress caused by evacuation.[77] Disruptions are pervasive and affect nearly everyone in some way—whether

76 Source: "Vital Signs: Sea Level," NASA, accessed August 14, 2018, https://climate.nasa.gov/vital-signs/sea-level/.

77 Aaron C. Davis et al., "Moving Florida's Many Seniors out of Irma's Path Has Unique Risks," *Washington Post*, September 9, 2017, https://www.washingtonpost.com/national/the-hidden-death-toll-of-hurricane-evacuations/2017/09/09/530fc358-94d6-11e7-89fa-bb822a46da5b_story.html?utm_term=.5f6a30d59115.

they are deadly, expensive, or inconvenient—and many who are affected will never recover.[78]

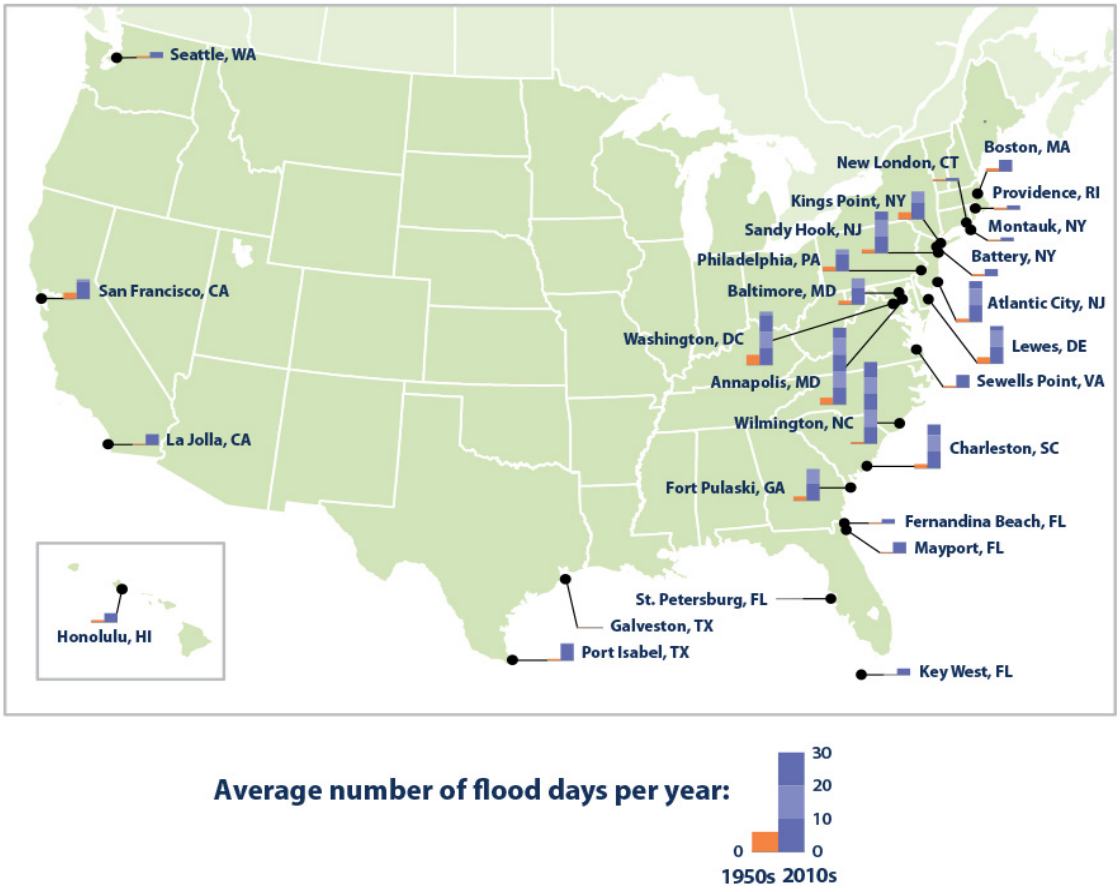

Figure 4. The Average Number of Flood Days per Year, for a Collection of American Cities[79]

Secondary effects or cascading impacts triggered by the primary event can be cumulative and can result in catastrophic long-term consequences for the community. Simply stated, climate change–induced impacts have the ability to exacerbate existing

78 "Disasters," American Psychological Association, accessed October 25, 2017, http://www.apa.org/topics/disasters/.

79 Source: "Climate Change Indicators: Coastal Flooding," Environmental Protection Agency, accessed August 14, 2018, https://www.epa.gov/climate-indicators/climate-change-indicators-coastal-flooding.

weaknesses, turning them into progressively more catastrophic events.[80] These are the impacts that can be persistent and have long-term effects if community functions and a sense of normality are not restored fairly quickly. For example, essential services such as running water, electricity, sewage treatment, and garbage pickup are basic necessities to resume normality. Tangible tax base elements are critical, such as people returning to work and companies resuming production. The private sector understands the cost of long recovery periods and the risk associated with businesses' recovery. Each day a company cannot recover operational capacity increases the likelihood that the business will fail. Small businesses impacted by disaster have almost a 40 percent failure rate and 25 percent cannot survive a year after impact.[81] When businesses fail, communities lose an important element that powers the local economy.

Consider secondary impacts that threaten entire sectors of society if recovery cannot take place quickly to restore balance. These are the climate impacts feared most by national security professionals, and they present the direst threats to human security itself.[82] Impacts range from reliability of basic life sustenance, such as food and water, to the increased vulnerability of coastal communities that could lead to unprecedented voluntary and forced migration.[83] As climate change impacts intensify, each community will be affected in some way depending on its unique "climate sensitivity."[84] Neighboring communities will also be affected, as they face pressure on their own resources to feed, water, and shelter their devastated neighbor. Less stable areas may be unable to absorb the

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80 Michael Oppenheimer et al., "Emergency Risks and Key Vulnerabilities," in *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects*, eds. Mike Brklacich and Sergey Semenov (Cambridge, UK: Cambridge University Press, 2014) 1042, https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap19_FINAL.pdf.

81 "Protecting Your Business," Federal Emergency Management Agency (FEMA), accessed October 9, 2017, https://www.fema.gov/protecting-your-businesses.

82 DoD, "National Security Implications," 3.

83 President of the United States, *National Security Strategy*, 12.

84 USGCRP, "National Climate Assessment," sec. "Supplemental Message 5.

added pressure posed by migration, triggering backlash that may manifest in civil unrest or outright conflict.[85]

Take the Syrian refugee crisis, for example, which has been described as a climate change–induced tragedy.[86] Intense and persistent drought from 2006 to 2010 caused widespread crop failures and food shortages.[87] Nearly 60 percent of Syria's land became desertified, accompanied by an 80-percent loss of livestock by 2009.[88] Culminating in civil unrest from food and water shortages, urban areas became hotbeds of friction. This instability contributed to volatility and political crisis. Already situated in a high-risk area, the events became an opportunity for terrorists to expand from neighboring Iraq. This was the way the Islamic State of Iraq and Syria came to be. Ultimately, the people of Syria sought escape from what became the Syrian Civil War, resulting in mass migration across Europe.[89] Filippo Grandi, the United Nations high commissioner for refugees, claimed, "Syria is the biggest humanitarian and refugee crisis of our time."[90] Indeed, the climate sensitivity of the area rendered Syria tragically vulnerable to a humanitarian disaster that was felt by numerous other nations, especially in Europe, and even the United States.[91]

James A. Clapper, former director of National Intelligence and the Department of Defense, reported to Obama that climate threats are becoming increasingly dangerous to

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85 Caitlin E. Werrell and Francesco Femia, "Climate Change, the Erosion of State Sovereignty, and World Order," *Brown Journal of World Affairs* XXII, no. II (Spring/Summer 2016): 225.

86 Vikram Mansharamani, "A Major Contributor to the Syrian Conflict? Climate Change," PBS Newshour, March 17, 2016, http://www.pbs.org/newshour/making-sense/a-major-contributor-to-the-syrian-conflict-climate-change/.

87 Werrell and Femia, "Climate Change," 225.

88 "How Could a Drought Spark a Civil War?" NPR, September 8, 2013, www.npr.org/2013/09/08/220438728/how-could-a-drought-spark-a-civil-war.

89 Werrell and Femia, "Climate Change," 225.

90 "Syria Conflict at 5 Years: The Biggest Refugee and Displacement Crisis of Our Time Demands a Huge Surge in Solidarity," United Nations High Commissioner for Refugees, March 15, 2016, http://www.unhcr.org/afr/news/press/2016/3/56e6e3249/syria-conflict-5-years-biggest-refugee-displacement-crisis-time-demands.html.

91 Mansharamani, "Syrian Conflict."

U.S. national security.[92] Threats by climate change include instances of persistent extreme drought, coastal sea-level rise (refer back to Figure 2), intensification of torrential rains, increasingly frequent flooding (Figure 4), more frequent and intense heat waves, a growing frequency of wildfire and wildland-urban interface fires, an expansion of vector-borne diseases, and domestic and international mass migration that trigger global instability and international conflict.[93] While these threats exist today, climate change will continue to be a "threat multiplier," increasing the likelihood as well as the magnitude of the impacts.[94]

A. HOMELAND SECURITY

National security interests in climate change are not unique to the United States.[95] The preceding discussion illustrates that weather and climate have significant effects on societal, civil, and fiscal circumstances worldwide.[96] As previously established, scientists are projecting weather and climate extremes in the near future that may have severe threats to the security of the United States and other nations.[97] This concern is putting increased pressure on governments around the world to provide a viable path forward that will allow citizens and societies to thrive under severe pressures forced by climate change.[98]

Societal vulnerability is rooted in the strength of socio-economic and built environments to protect our livelihoods.[99] Given our vulnerabilities, as well as how costly it is to recover from natural disasters, it is unclear if the United States has enough economic resilience to withstand an intensifying disaster response scenario.[100] The plots in Figure 5

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92 National Intelligence Council, "Implications for U.S. National Security of Anticipated Climate Change," NIC WP 2016-01 (Memorandum, Office of the Director of National Intelligence, 2016), https://www.hsdl.org/?view&did=795549; DoD, "National Security Implications.

93 National Intelligence Council, "Implications"; DoD, "National Security Implications."

94 Youngs, *Climate Change*, 38.

95 Youngs, 42–46.

96 National Intelligence Council, "Implications," 6.

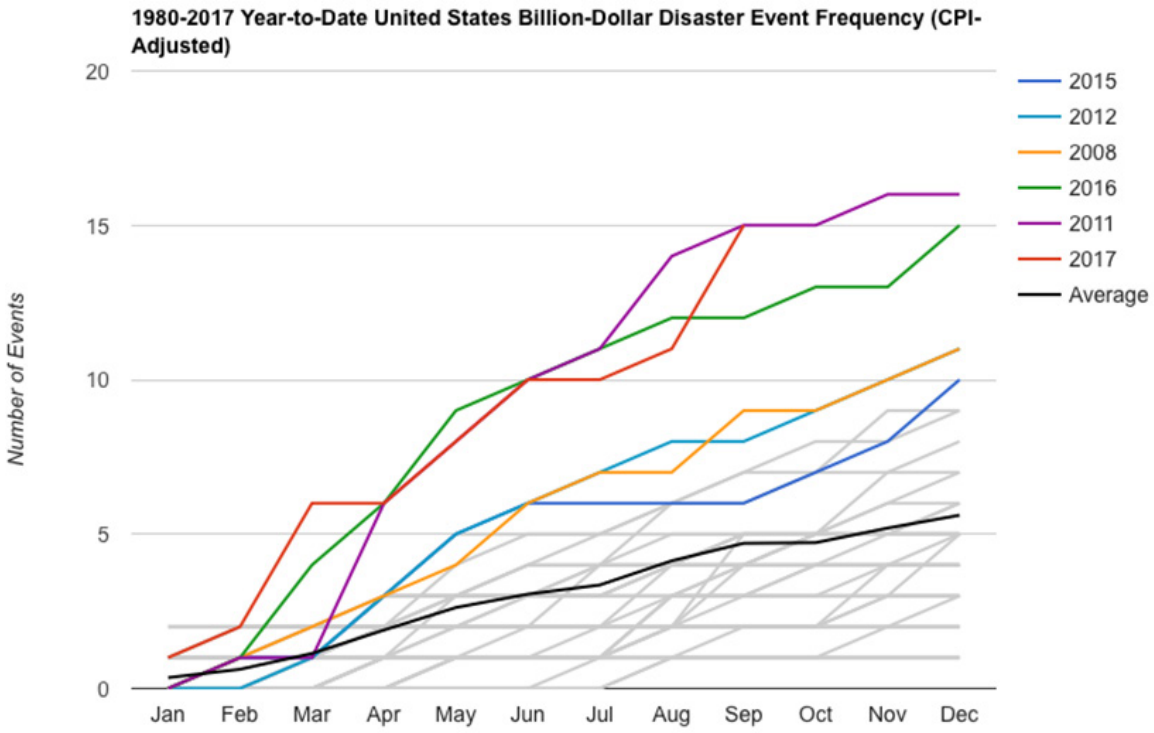
97 National Intelligence Council, 6–11.

98 National Intelligence Council, 6.

99 Papadopoulos, *Resilience*, 17.

100 Papadopoulos, 15.

show the number of annual disaster events costing more than a billion dollars each in the United States. Notably, the number of occurrences is rising and maintaining a trajectory well above the historical average. These changes are particularly difficult to plan for, since the use of a historical average would grossly under-predict the needs for the following year.



Event statistics are added according to the date on which they ended. Statistics valid as of October 6, 2017. Note that the historical average greatly undershoots recent experience.[101]

Figure 5. Billion-Dollar Natural Disaster Events Each Year, by Month, from 2008 to Present[102]

As extreme heat becomes more prevalent, urban and agricultural areas could also experience drastic swings between torrential rain and drought, creating alternating disasters

101 "Billion-Dollar Weather and Climate Disasters: Overview," NOAA, accessed August 30, 2018, https://www.ncdc.noaa.gov/billions/.

102 Source: Adam B. Smith, "2017 U.S. Billion-Dollar Weather and Climate Disasters: A Historic Year in Context," NOAA, January 8, 2018, https://www.climate.gov/news-features/blogs/beyond-data/2017-us-billion-dollar-weather-and-climate-disasters-historic-year.

of flooded-out crops and not enough rain to bring crops to harvest.[103] Dependency on rain and water sources will become tenuous, especially drinking water. All Americans, particularly the poor and elderly, will be more vulnerable to emerging diseases and extreme heat events.[104] Migration around the world is predicted to become a growing problem due to these very same threats, including in the United States.[105] These are the tangible outcomes that threaten national security.

The following sections discuss real-world scenarios that scientists and national security professionals understand are tied to the climate change threat.

B. FOOD SECURITY

The United States is accustomed to year-round access to an abundance and variety of food and food sources. The United States Department of Agriculture (USDA) stipulates climate change has a significant potential to restrict food availability.[106] A 2015 USDA report illustrates food crops' high sensitivity to concentrated emissions in the atmosphere. The study found a direct correlation between higher concentrations of pollutants and food production; degrees of heat and cold, precipitation location and intensity, and seasonal changes—which were found to be affected by emissions and pollutants—affect the length of the growing season.

Furthermore, weather disruption can devastate food availability globally. Unchecked global emissions through this century are projected to drastically decrease the international food supply, among other natural resources. Due to forced systemic changes in the Earth's climactic behavior, significant temperature and precipitation changes are expected. At a minimum, the average temperature in the United States is expected to increase in the next twenty years between 3 and 10 degrees Fahrenheit (between 1 and 7

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103 M.E. Brown et al., *Climate Change, Global Food Security and the U.S. Food System* (Washington, DC: USDA, 2015), 19, http://doi.org/10.7930/J0862DC7.

104 "Climate Effects on Health," Centers for Disease Control and Prevention (CDC), last updated July 26, 2016, https://www.cdc.gov/climateandhealth/effects/default.htm#factsheets.

105 CDC.

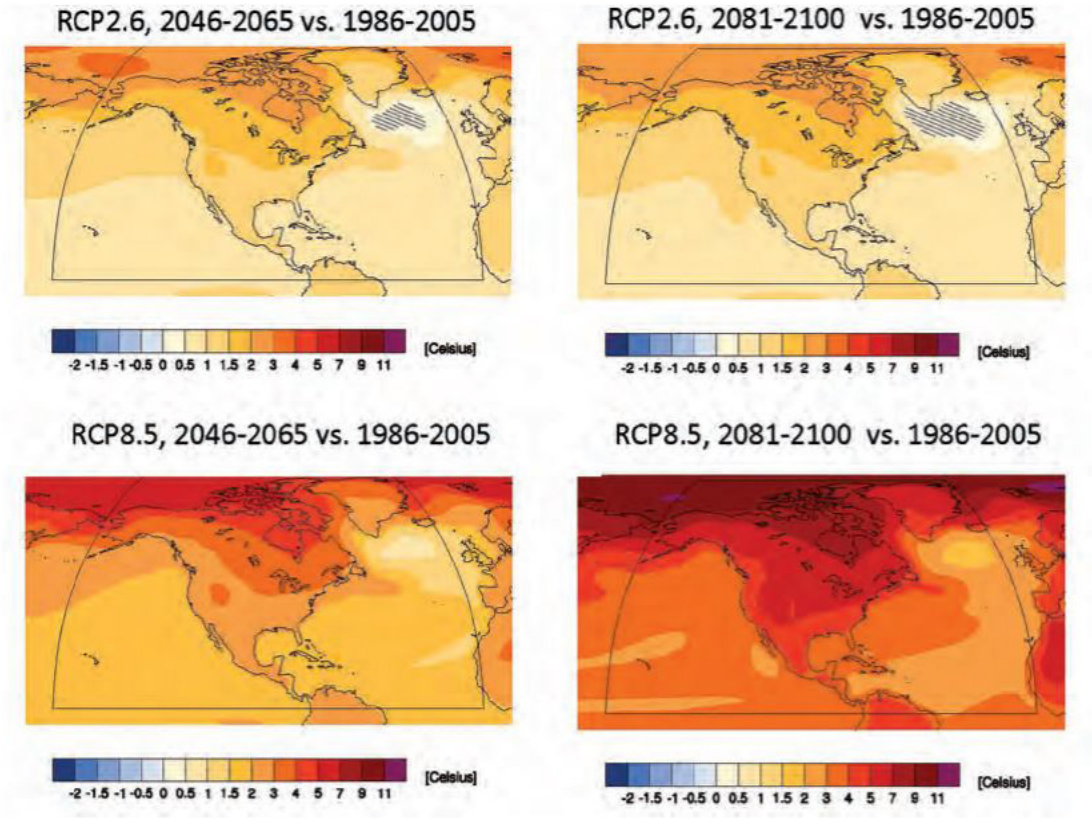
106 Brown et al., *Climate Change*.

degrees Celsius).[107] The temperature and precipitation changes will directly impact agricultural and livestock production and distribution that will trickle down to food availability and cost.[108] With temperature changes predicted to occur more rapidly than in the previous century (see Figure 6), humans will need to develop adaptive intervention measures to fulfill domestic and global food demands. According to the USDA, establishment of a U.S. adaptation partnership will be needed in four critical sectors: global trade, food aid, developmental support, as well as technological capability and information.[109]

107 Brown et al., 95.

108 National Intelligence Council, "Implications," 8.

109 Brown et al., *Climate Change*, 97.



RCP 2.6 is the lowest emissions achievable; and RCP 8.5 is the current projected global emission.

Figure 6. Projections of U.S. Surface Temperatures[110]

Today, the United States exports more food than other country, but will soon be surpassed by others—notably, China. Currently, the United States is experiencing a reduction in harvestable agriculture largely because of decreased public investment in research and development. This comes at a time when technological advancement in crop sustainability is a growing concern.[111] Additionally, food prices are highly sensitive to supply and demand; crop-to-harvest considerations, production, and delivery and are therefore critical to market stability. As climate pressures intensify, world food prices will be affected, as will geo-political stability.[112] International food instability can put increasing

110 Source: Brown et al., 96.

111 Brown et al., 106.

112 Brown et al., 108.

pressure on the United States to provide more food to other countries or accept increasing numbers of immigrants, which could aggravate political tensions and lead to conflict.[113] Greenhouse gas concentrations directly affect food insecurity, especially for fragile areas that are susceptible to degradation. By 2080, USDA modeling found as many as 235 million people may be malnourished due to climate impacts.[114]

The USDA predicts, furthermore, that security of food production and resourcing will become an increasingly important sector for the United States as climate changes continue to manifest. With a predicted decline in U.S. exports, imported food commodities and sources will become more important to the U.S. food system. Everything from crop yields through supply chain logistics will become more vital, especially in areas challenged by climate extremes and frequency of climate-induced stressors, such as sea-level rise, drought, intense heat, and record rainfall events. The direct impact on yields may be compounded by impacts on secondary support systems, such as harvesting, preparation and storage for market, movement, contamination, disease, and the quality and nutritional value of the food.[115] These pressures will have a direct effect on global availability and local affordability of fresh and nutritious food.

Equally important is the potential disruption to the physical delivery of goods to domestic and foreign markets due to infrastructure that has not been adequately adapted to climate change. Transportation corridors in the United States are of particular concern, not only for maintaining freshness, but also for timely export and import. For example, a hurricane in the Gulf region could place as many as 41 percent of railroads and 51 percent of cargo facilities at risk of inundation and disruption.[116] A smaller storm is estimated to endanger a third of regional rail lines.[117] Additionally, sea-level rise has the capacity to put

113 National Intelligence Council, "Implications," 9.

114 Brown et al., *Climate Change*, 46.

115 Brown et al., 1–3.

116 Brown et al., 107.

117 Brown et al., 107.

28 percent of highway miles at risk with just a three-foot increase.[118] Insufficiently adapted seaports and significant portions of the U.S. highway system will face greater risks from storm surge without investment in resilient infrastructure.

These underlying pressures increase potential losses for the U.S. food system, including financial losses. The early impacts of climate change are affecting the United States today; we need adaptive techniques to offset the growing risk to our food supply.[119]

C. WATER SECURITY

Like food security, water security is a persistent and growing problem in the United States and many nations worldwide.[120] The reliable weather patterns we count on to recharge underground and surface freshwater sources throughout the year are becoming increasingly tenuous as climate variations disrupt predictability. Water security encompasses not only water for purification and drinking but also for agriculture irrigation, industrial uses, fishing and hatcheries, wetlands and biodiversity, oceans and marine biology, the precipitation cycle, sustainable forests, recreation, and numerous other uses in daily life. Indeed, water is the essence of life; mankind depends on reliable access to it to survive.

Drought, changing weather patterns, extreme heat, and other forces challenge that dependability. For example, the southwest United States is partially, but significantly, dependent on annual accumulations of mountain snowpack for fresh water. Warming weather affects precipitation, which changes the snow to rain in the mid-elevations, reducing snowpack storage (see Figure 7).[121] Populations in the southwestern United States

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118 Brown et al., 107.

119 Brown et al., ix.

120 Climate Change and Water Security," UNESCO, accessed December 13, 2016, http://en.unesco.org/themes/addressing-climate-change/climate-change-and-water-security.

121 "Snow Cover on the Decline in North America," Climate Central, February 8, 2017, http://www.climatecentral.org/gallery/graphics/snow-cover-on-the-decline-in-north-america.

and other arid regions continue to grow, which increases their need for abundant and reliable fresh water.[122]

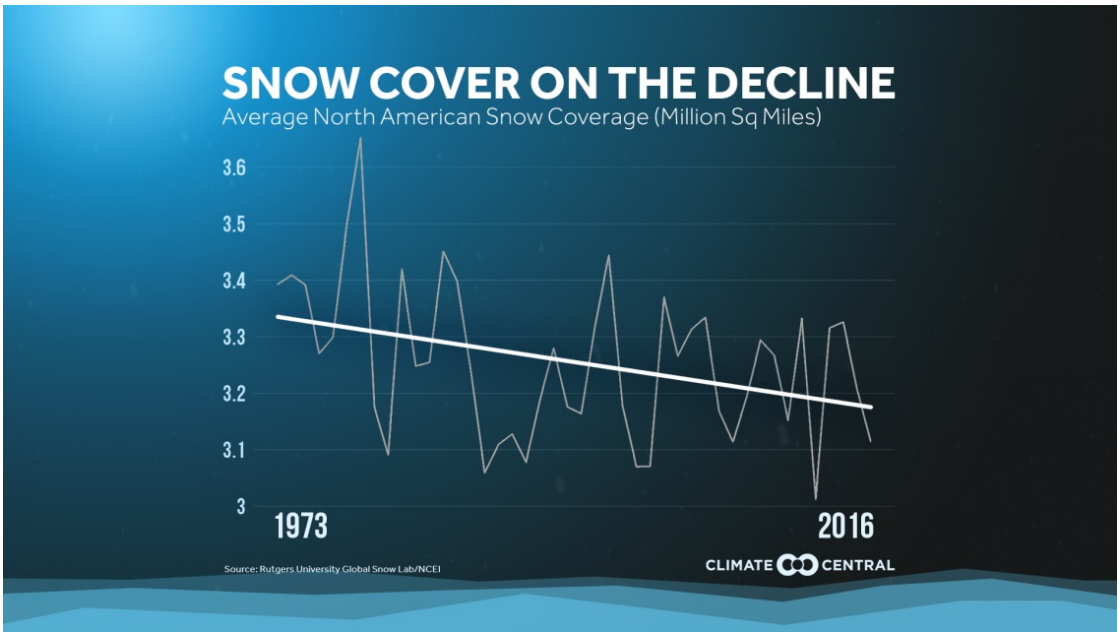

Figure 7. Decline in North American Snow Cover[123]

California's recent five-year drought demonstrates that winter snowfall and rainy seasons are unreliable, especially as the weather patterns change.[124] Competition for water sources is occurring across the United States and globally. Business interests increasingly compete with cities and towns for the same freshwater sources, which has created new challenges in the courts.[125] In 2014, the GAO conducted a review of a 2003 trend report on

122 National Drought Resilience Partnership, "Report to the Council on Climate Preparedness and Resilience" (report, National Drought Resilience Partnership, August 2016), www.drought.gov/drought/sites/drought.gov.drought/files/NDRP%20August%20Report%20FINAL%208.30.16.pdf.

123 Source: Climate Central, Snow Cover."

124 "California Drought," United States Geological Survey (USGS), November 3, 2016, http://ca.water.usgs.gov/data/drought/.

125 Albert Fry, *Industry, Fresh Water and Sustainable Environment* (World Business Council for Sustainable Development and the United Nations Environment Programme, 1998), 7, http://apps.unep.org/redirect.php?file=/publications/pmtdocuments/-Industry,%20freshwater%20and%20Sustainable%20Development-19981931.pdf.

water supply sourcing and competition in the United States.[126] The review found that population growth, extreme weather, and demand from the energy sector are primary drivers for water resourcing and use concerns. Starting in 1950, the United States Geological Survey has produced a quinquennial report on types of water usage in the United States; the most recent review was published in 2010.[127] This report shows that withdrawals for thermoelectric power and agricultural use comprise the largest markers, followed by public water drawdowns that, when combined, claim approximately 90 percent of freshwater sources, as shown in Figures 8 and 9.[128]

Water security is not a unilateral concern of supply and demand for human survival solely in the United States. Water is the essential element for all life on Earth, and the functioning of Earth as we know it. Of all water on the Earth, just 2.5 percent is fresh water and almost 70 percent is frozen in glaciers.[129] The illustration in Figure 10 shows the balance of Earth's water sources and uses of fresh water.[130]

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126 GAO, *Freshwater: Supply Concerns Continue, and Uncertainties Complicate Planning*, GAO-14-430 (Washington, DC: GAO, 2014), https://www.gao.gov/assets/670/663343.pdf.

127 Molly A. Maupin et al., *Estimated Use of Water in the United States in 2010*, USGS Circular 1405 (Reston, VA: USGS, 2014), https://pubs.usgs.gov/circ/1405/pdf/circ1405.pdf.

128 Maupin et al., 7.

129 Director of National Intelligence, *Global Water Security*, ICA 2012-08 (Washington, DC: Office of the Director of National Intelligence, 2012), ii, https://www.dni.gov/files/documents/Special%20Report_ICA%20Global%20Water%20Security.pdf.

130 Director of National Intelligence, ii.

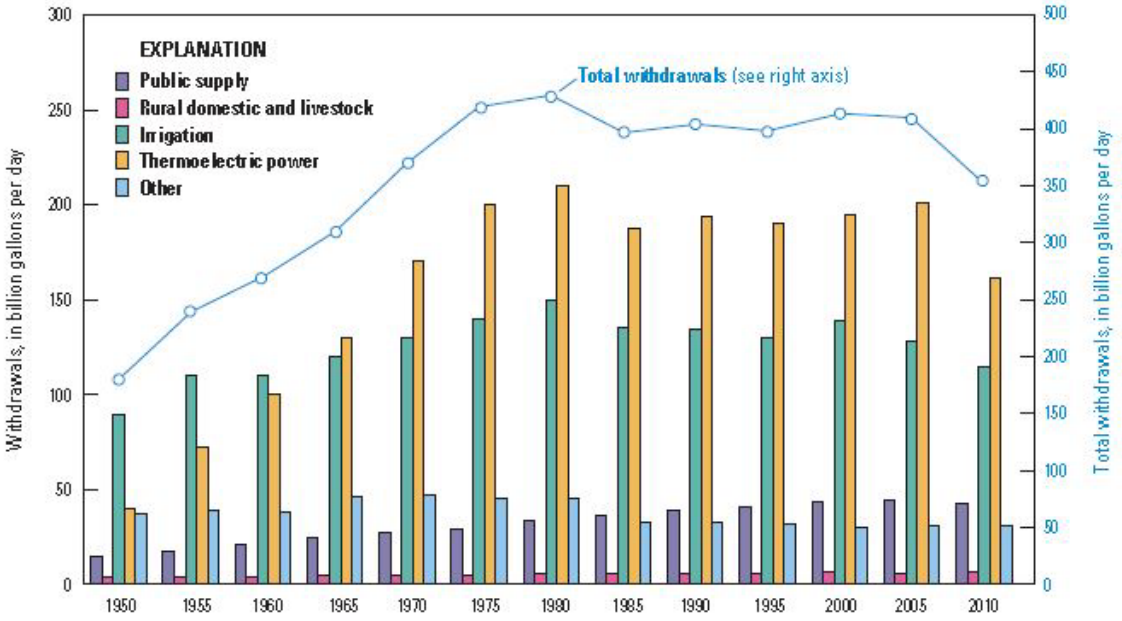

Figure 8. Total Freshwater Withdrawals by Category from 1950 to 2010[131]

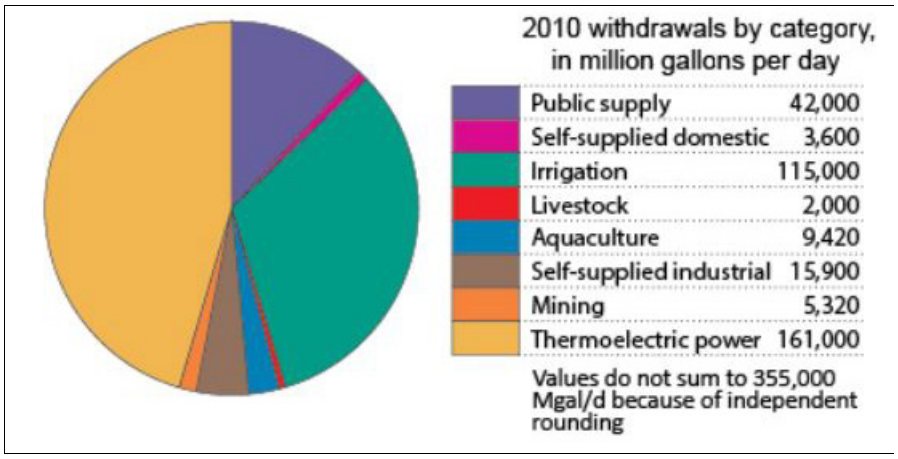

Figure 9. Total Freshwater Withdrawals from 1950 to 2010 per Day[132]

131 Maupin et al., *Water in the United States*, 46.

132 Source: Nancy L. Barber, "Summary of Estimated Water Use in the United States in 2010," USGS, November 2014, https://pubs.usgs.gov/fs/2014/3109/pdf/fs2014-3109.pdf.

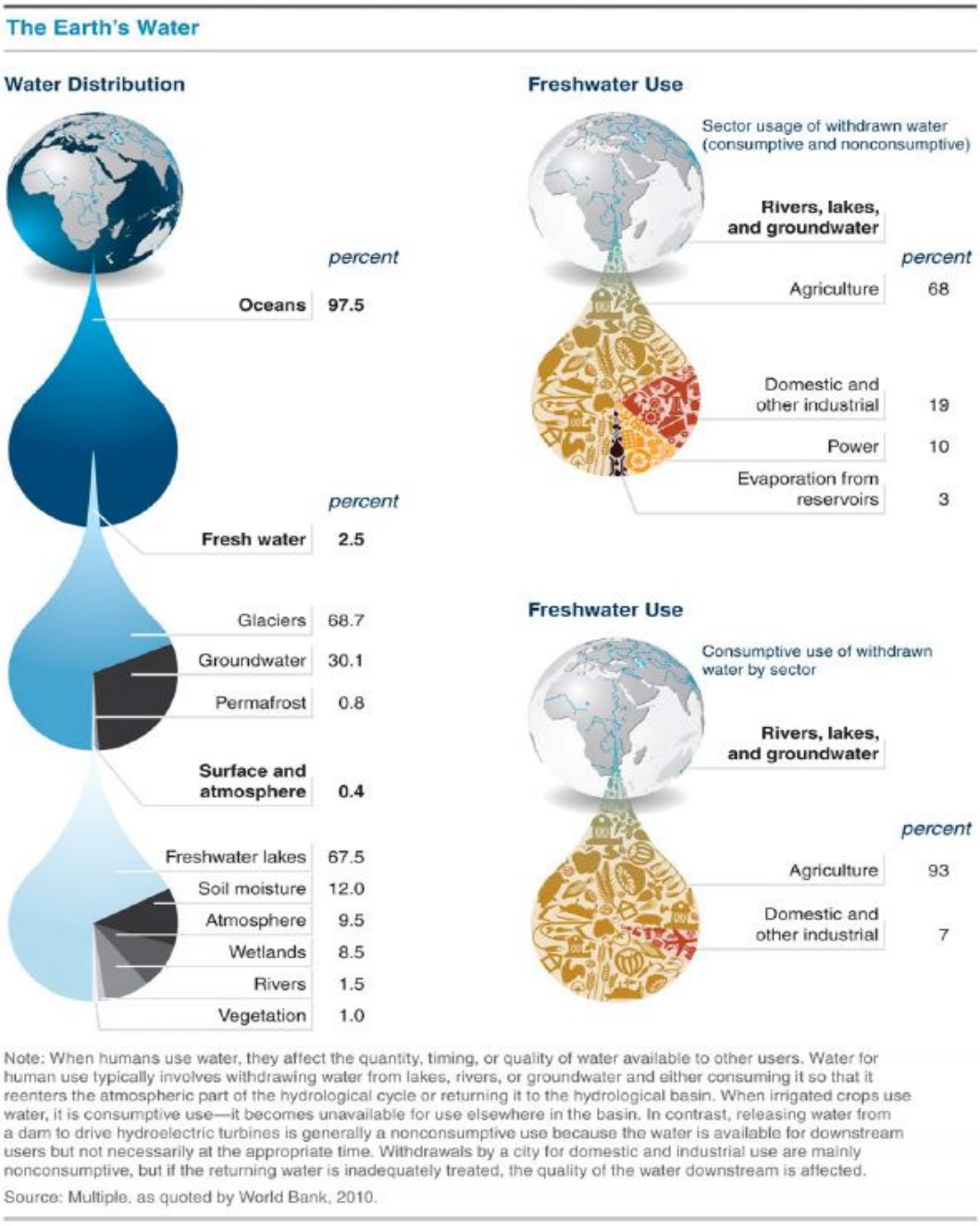

Figure 10. Global Freshwater Distribution and Usage[133]

By 2023, a report from the Director of National Intelligence predicts instability will prevail in countries around the world that are important to U.S. interests. Primarily due to

133 Source: Director of National Intelligence, *Global Water Security*.

inadequate fresh water supplies, today's shared resources will become increasingly leveraged and potentially weaponized as water becomes scarcer. In that time, agricultural impacts can have global consequences and place increased stress on other regions with compromised water dependencies.[134] The report further claims that, over the next twenty years, world economic trade will experience water stress primarily due to drought and insufficient surface water to maintain adequate hydropower.

At the opposite end of the drought and dwindling fresh water spectrum, other water threats are just as pervasive, damaging, and expensive. The National Oceanic and Atmospheric Administration (NOAA) predicts most coastal communities in the United States will experience more than a month of flooding annually by mid-century.[135] The National Climate Assessment predicts heavy rain will continue to increase in the United States, following patterns observed since 1958 (see Figure 11). Additionally, sea-level rise is a dangerous element directly attributed to a warming planet. Cities around the country are developed without regard to elevation changes; salt water intrusion into the water system, infiltration of seawater into drainage systems, and an inability to allow storm-water runoff to drain into the sea threatens communities. Because oceans are carbon dioxide sinks, the water continues to warm and glaciers and icebergs melt ever faster, expanding water bodies around the world.[136] Coastal communities in particular face increasingly devastating storm surges; land-falling hurricanes exacerbated by these conditions will have impacts on buildings and infrastructure.

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134 Director of National Intelligence, iv.

135 "NOAA Establishes 'Tipping Points' for Sea Level Rise Related Flooding," NOAA, December 18, 2017, www.noaa.gov/media-release/noaa-establishes-tipping-points-for-sea-level-rise-related-flooding.

136 Gore. *An Inconvenient Sequel*, 63.

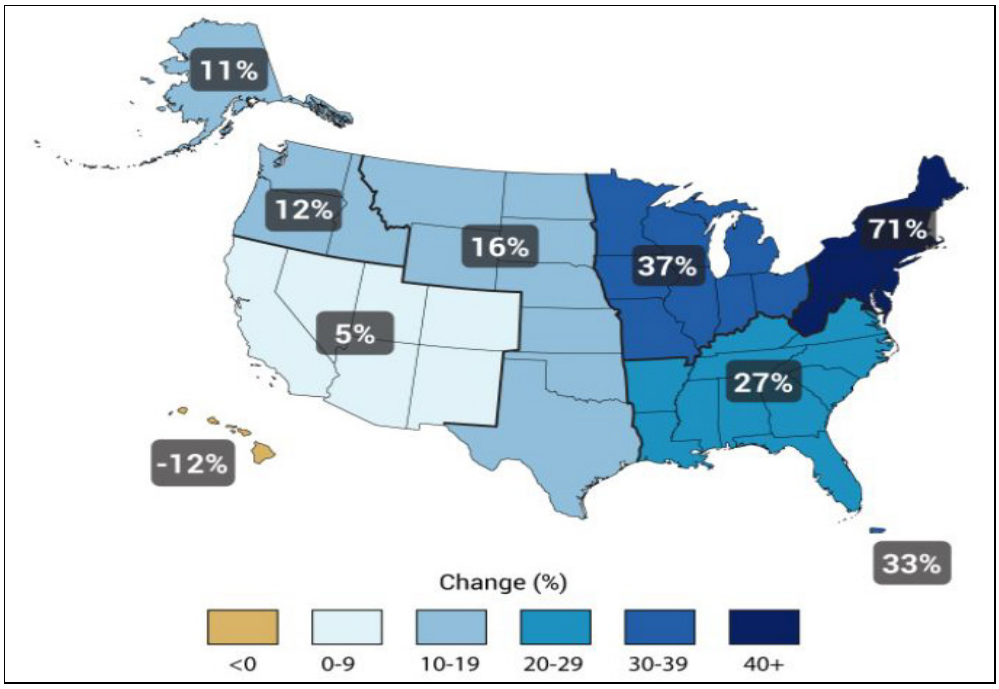

Figure 11. Observed Change in Very Heavy Precipitation 1958 to 2012[137]

D. HEALTH SECURITY

While public health may seem to have an indirect threat from climate change, it is, in fact, a great concern: climate changes exacerbate the frailty of human health (see Figure 12).[138] The Centers for Disease Control and Prevention's mission is to study, monitor, and correlate complexities of climate change impacts on human health.[139] As heatwaves become hotter and more persistent, sensitive health groups may become overwhelmed by the heat, suffer heatstroke, or further complicate existing health issues.[140] Climate change has also been implicated in the proliferation of vector-borne illnesses, which can be spread through insects that carry infectious diseases from animal to animal, animal to human, or human to human.[141]

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137 Source: USGCRP, "National Climate Assessment," sec. "Our Changing Climate," Figure 2.18.

138 National Intelligence Council, "Implications," 9.

139 CDC, "Climate Effects on Health."

140 National Intelligence Council, "Implications," 9.

141 National Intelligence Council, 9–10.

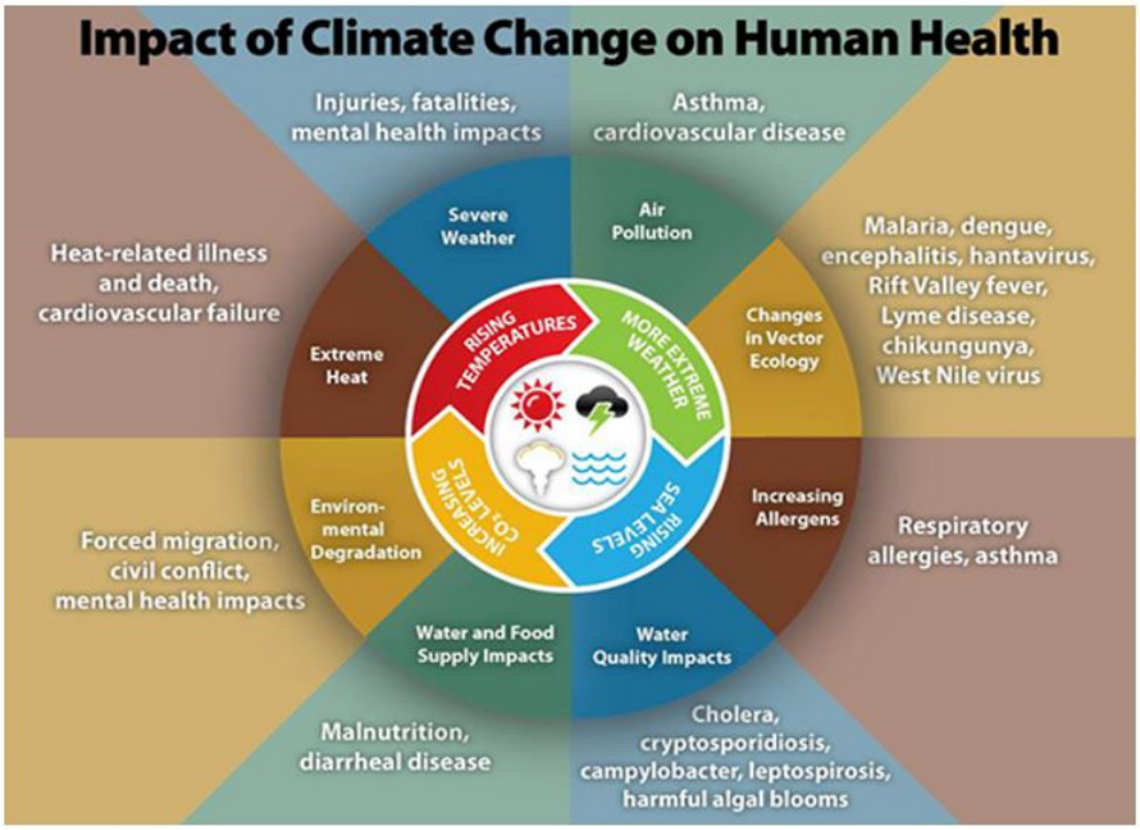

Figure 12. Impact of Climate Change on Human Health[142]

Additional concerns include the location and building design of healthcare facilities, which must be situated out of harm's way.[143] Hospitals and healthcare facilities cannot be easily evacuated in the event of a surprise flood or tornado. The United States has witnessed this firsthand, struggling with the complexity of evacuating convalescent homes for the elderly or other critical care recovery centers located in flood risk areas.[144] Healthcare facilities not in direct threat from natural disasters can easily be impacted by

142 Source: CDC, "Climate Effects on Health."

143 "U.S. Climate Resilience Toolkit," NOAA, last modified November 22, 2016, https://toolkit.climate.gov/topics/human-health/building-climate-resilience-health-sector.

144 Sheri Fink and Alan Blinder, "Houston's Hospitals Treat Storm Victims and Become Victims Themselves," *New York Times*, August 28, 2017, https://www.nytimes.com/2017/08/28/us/hurricane-harvey-houston-hospitals-rescue.html.

secondary support interruptions, such as electricity, food, water, medicines, and supplies that have life-threatening implications when disrupted.[145]

Pollution is also a threat to health security.[146] Notably, a groundbreaking study on pollution and health by the Lancet Commission concludes that pollution is accountable for approximately 9 million deaths around the world each year (see Figure 13).[147] The majority of are caused by pollutants in ambient air, followed by household air, and lastly by ground and water pollution. These are many of the same pollutants that blanket the Earth and systemically change the climate.

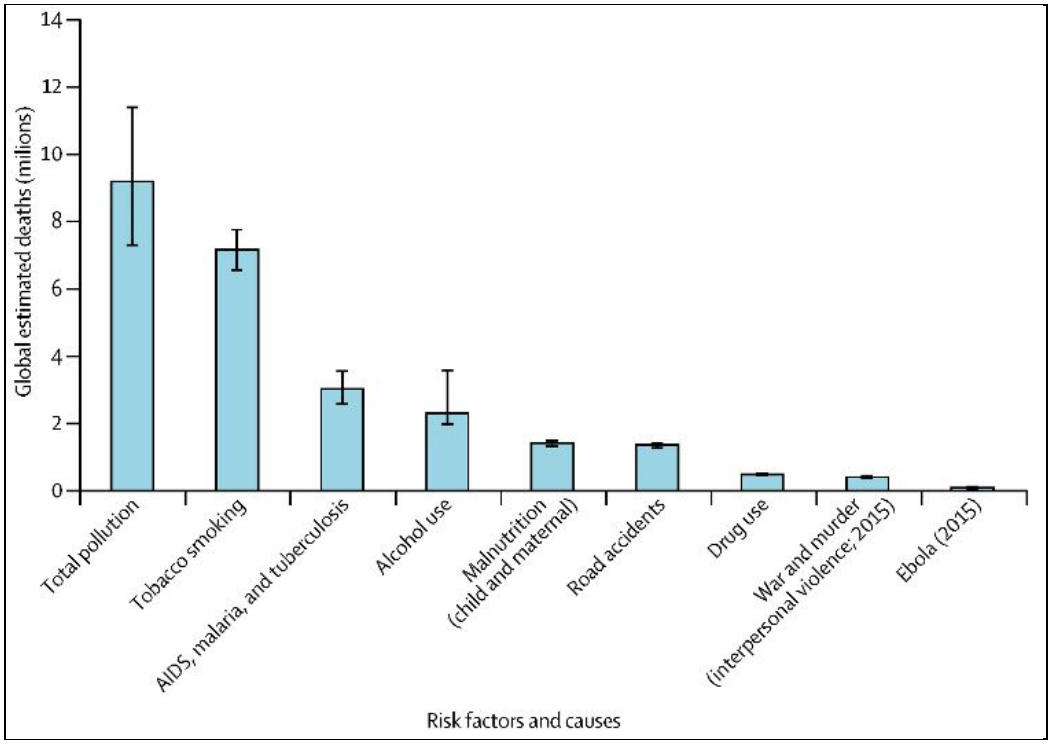

Figure 13. Pollution-Related Deaths and Common Risk Factors, 2015[148]

145 CDC, "Climate Effects on Health."

146 NOAA, "Climate Resilience Toolkit."

147 Philip Landrigan et al., "The *Lancet* Commission on Pollution and Health," *The Lancet Commissions* 391, no. 10119 (February 2018): 462–512, https://doi.org/10.1016/S0140-6736(17)32345-0.

148 Source: Landrigan et al.

E. DOMESTIC AND INTERNATIONAL SECURITY

As climate changes put pressure on various sectors in the United States and globally, it is probable that domestic and international tensions will escalate.[149] Migration from neighboring countries seeking security in the United States could become a more intense problem, as well as migration pressures—especially in areas facing political turmoil or conflict.[150] As the world population increases, local and state governments will face increasing pressure to provide critical natural resources such as water and food, as discussed previously in this chapter.[151] The National Intelligence Council and the Department of Defense have indicated their concern about international pressure to provide stability for at-risk nations.[152] According to the Climate and Migration Coalition, based in the United Kingdom, changes in climate have signature impacts on migration, as illustrated in Figure 14.[153]

In the United States, population growth and population aging both complicate migratory patterns. Urban centers and metropolitan areas are becoming increasingly popular for corporate growth, as they provide better job security and livelihoods for younger workers.[154] Concurrently, a large aging population is gravitating toward southern states and concentrating near coastal, waterfront, and rural areas.[155] People and services are becoming concentrated in areas that can experience emergency response and recovery complications, particularly if local and state emergency support is not keeping pace with

149 National Intelligence Council, "Implications," 10.

150 National Intelligence Council, 10.

151 National Intelligence Council, 10.

152 National Intelligence Council, 10.

153 "Infographic: Exploring Evidence for the Climate Change and Conflict Connection," Climate & Migration Coalition, accessed February 25, 2018, http://climatemigration.org.uk/infographic-exploring-evidence-for-the-climate-change-and-conflict-connection-2/.

154 Kyle E. Walker, "Baby Boomer Migration and Demographic Change in U.S. Metropolitan Areas," *Migration Studies* 4, no. 3 (November 2016): 347–372.

155 Walker.

the growth. It also places an aging population in an area at increased risk for future migration and natural disasters, as discussed previously.[156]

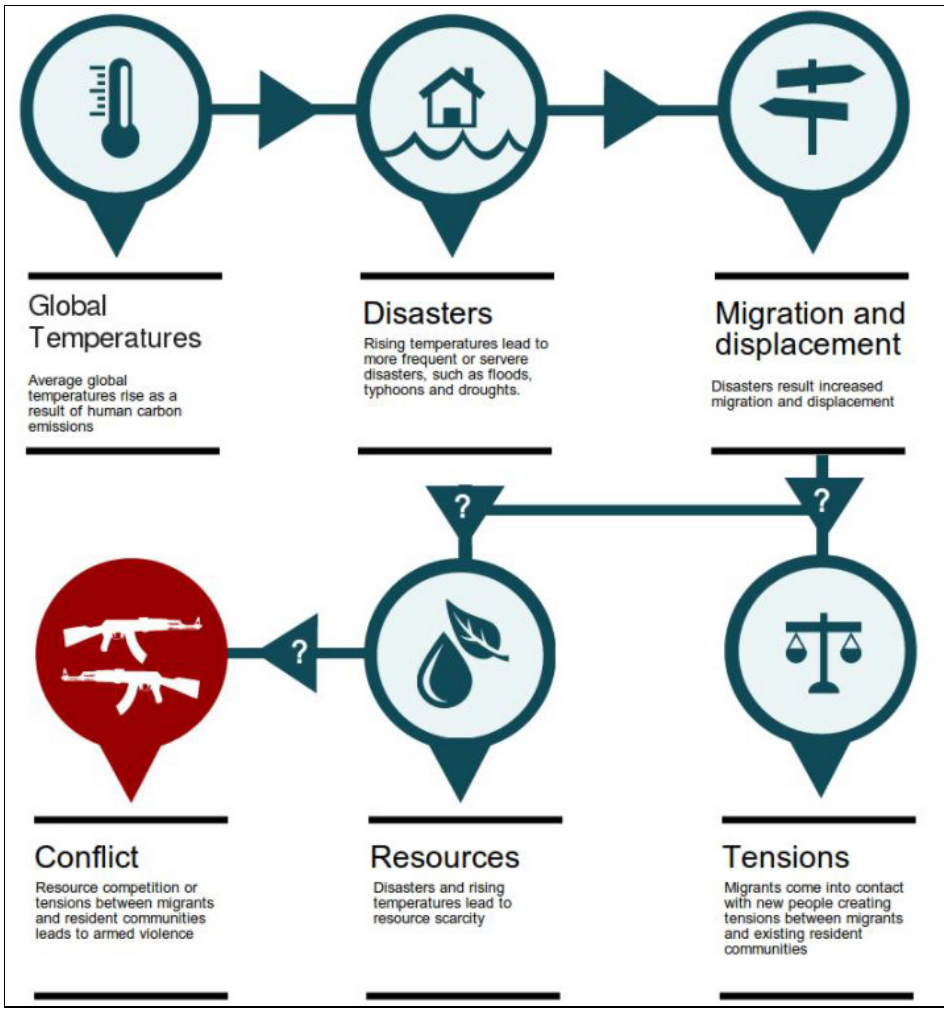

Figure 14. Climate Change–Induced Pathways Leading to Tensions and Potential Conflict[157]

156 Christopher Parenti, "If We Fail," *Jacobin*, August 29, 2017, https://jacobinmag.com/2017/08/if-we-fail.

157 Source: Climate & Migration Coalition, "Infographic."

In his book *Storming the Wall*, Todd Miller illustrates that we soon will no longer consider adaptation as an appropriate defense; it will become necessary to retreat from coastal cities.[158] When approximately 30 percent of the global population is located in coastal areas, he projects that nearly 700 million will be in danger of the effects of sea-level rise. Already, coastal cities in the United States have begun adaptation planning and implementation in earnest. Statistically, however, by the year 2030 nearly 55 million people will be exposed to floods and inundation, effectively doubling the existing exposure.[159] The crisis is not localized to the United States; Miller claims that 21.5 million people were forced into migration annually by environmental pressure from "climate-related hazards" between 2008 and 2015. As climate-induced pressure for survival increases, social, political, and ecological tensions will also become more prevalent. Miller's research identifies that border walls are becoming popular, especially in wealthier nations. The Berlin Wall was one of sixteen global border walls when it famously came down in 1988; today, however, there are more than seventy—and that number is increasing.[160] A fear of climate change–driven future mass migration, Miller vividly illustrates, is an important underlying reason for walls along the U.S. border to be built now.[161]

F. ECONOMIC SECURITY

Vulnerability to weather extremes may discourage new and existing business interests, which may not seem like safe investments.[162] Insurance companies are becoming increasingly risk averse as they attempt to find balance between providing financial safety nets to impacted policyholders, yet reserving the integrity of their investment.[163] Economically driven supply chains across the nation are of vital importance. Supply chains

158 Todd Miller, *Storming the Wall: Climate Change, Migration, and Homeland Security* (San Francisco: City Lights, 2017), 172.

159 Miller, 184.

160 Miller, 290.

161 Todd Miller. 331.

162 National Intelligence Council, "Implications," 10.

163 National Intelligence Council, 10.

keep the economy moving; disruptions can have severe impacts that affect local, national, and global market reverberation. Commodities are shipped by truck, air, and sea-going vessels, and companies everywhere depend on manufacturers from around the world, which leave them vulnerable to supply chain disruptions. For example, Puerto Rico's medical supply and pharmaceutical industries provide significant health products to the U.S. mainland.[164] Following Hurricane Maria in 2017, disruption to these industries had persistent and near-catastrophic secondary impacts for months: a dwindling national supply of intravenous fluid bags and other drugs during the influenza season wreaked havoc on the U.S. mainland.[165]

Just as Miller warned that the future climate change–induced migration threat heightens our incentive to build border walls, Stephen Morris of Bloomberg's *The Quint* speculates similar concerns about U.S. withdrawal from international partnerships.[166] Morris points to the unrelenting state-sponsored surge in cyberattacks on all forms of important infrastructure in the United States. He warns that hackers—as reported by the World Economic Forum—are attempting to "trigger a breakdown in the systems that keep societies functioning." His point is that the protectionist withdrawal from world partnerships will have economic and democratic tradeoffs. Interestingly, the World Economic Forum identifies extreme weather and natural disasters as "the biggest global risks for 2018," as illustrated in Figure 15.[167]

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164 Scott Gottlieb, "Statement from FDA Commissioner on Continued Assistance Following the Natural Disaster in Puerto Rico," U.S. Food & Drug Administration, October 6, 2017, https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm579493.htm.

165 Scott Gottlieb, "FDA Commissioner Updates on Some Ongoing Shortages Related to IV Fluids," U.S. Food & Drug Administration, January 16, 2018, https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm592617.htm.

166 Stephen Morris, "A Year after Trump, Davos Elite Fear Cyberattacks and War," *Bloomberg*, January 17, 2018, https://www.bloomberg.com/news/articles/2018-01-17/davos-elite-fear-cyberattacks-and-war-as-trump-stokes-tension.

167 Stephen Morris, "Davos Elite Fear Cyberattacks, War as Trump Stokes Tension," *Bloomberg*, January 17, 2018, https://www.bloomberg.com/news/articles/2018-01-17/davos-elite-fear-cyberattacks-and-war-as-trump-stokes-tension.

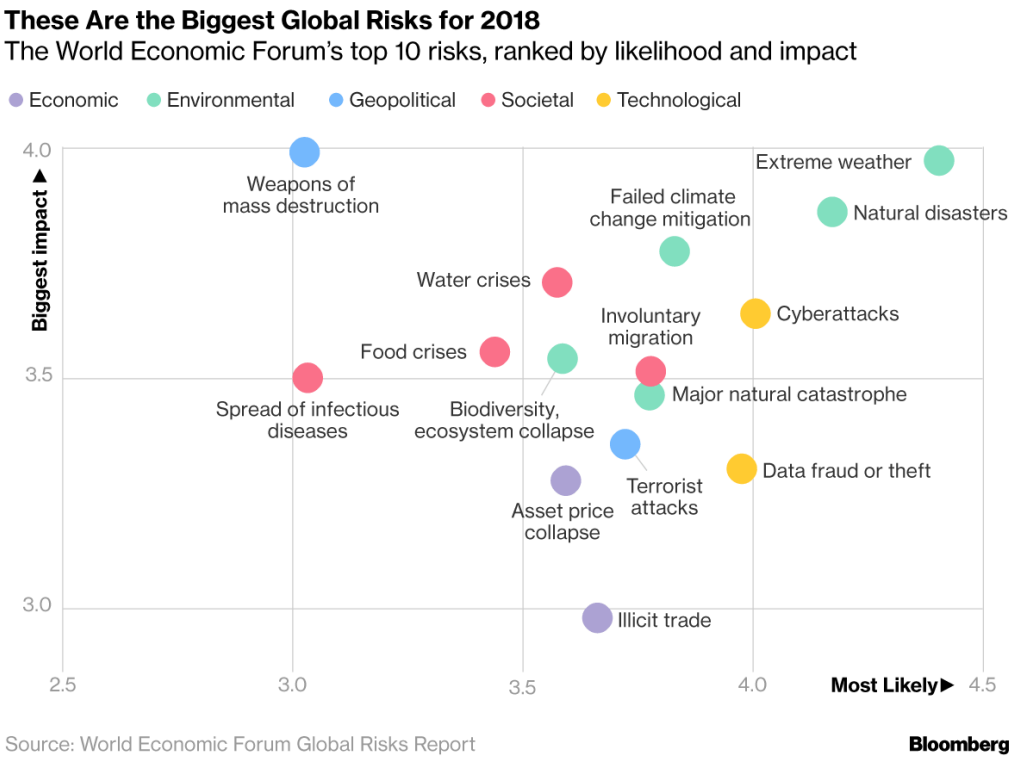

Figure 15. World Economic Forum Global Risks Report 2018[168]

Economic concerns in the United States are also very much tied to the national debt. Unfortunately, disasters such as extreme weather events are not annually budgeted. However, any natural disaster that impacts the United States, its territories, or protectorates and that meets federal economic thresholds for damages is eligible for significant federal assistance.[169] Since the United States does not have a disaster savings account and disasters are not budgeted, the money to pay for disaster assistance must be borrowed, which increases the national debt. The United States is now experiencing billion-dollar weather disasters more frequently than ever; in 2017 alone, sixteen weather events in the United States accrued billions of dollars, each, in damages (see Figure 16).[170] The previous year,

168 Source: Morris.

169 Robert T. Stafford Disaster Relief and Emergency Assistance Act, Pub. L. 93-288 (2016), codified at *U.S. Code* 42, ch. 68 § 5121 et seq.

170 Smith, "2017 Disasters."

2016, set the second highest record, at fifteen billion-dollar U.S. natural disasters.[171] Each new disaster added at least a billion dollars to the national debt; for 2016–17, that means at least 29 billion dollars in increased debt in just two years. Furthermore, the United States does not fully recover from previous disasters before it experiences the next ones. As climate impacts intensify, the economic impacts will, too. As a debtor nation, our trend of funding disaster response and recovery will be difficult to sustain.

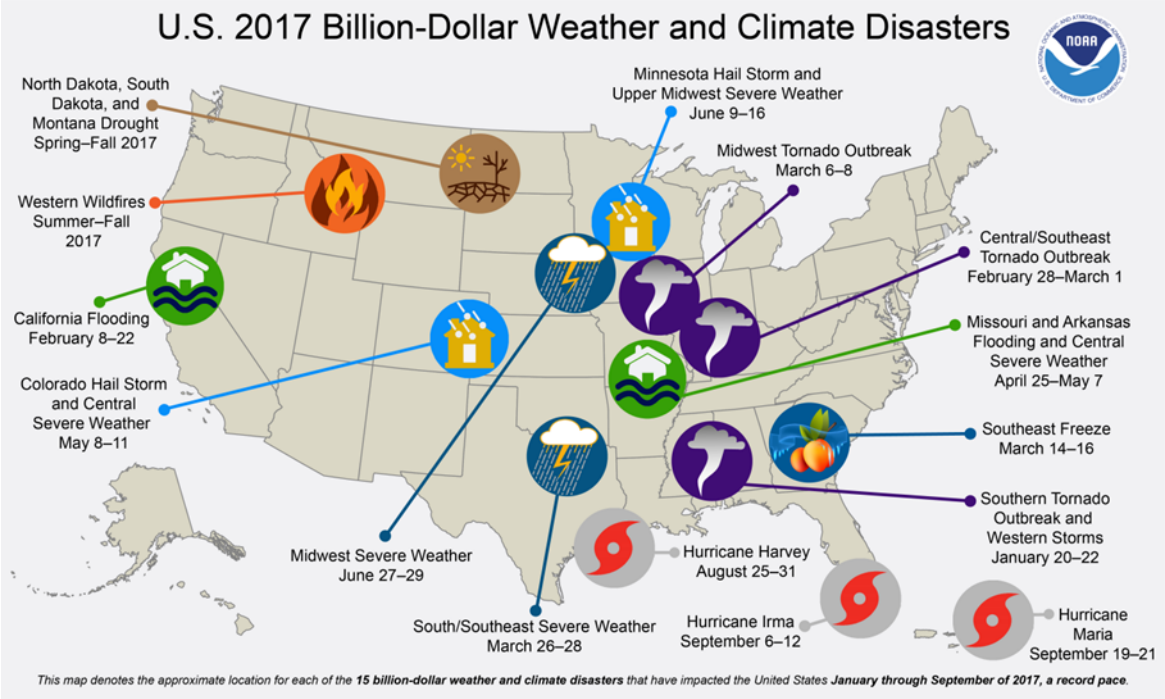

Figure 16. NOAA 2017 Billion-Dollar Weather and Climate Disasters[172]

Furthermore, disasters are increasingly associated with flooding, which raises additional concerns for the national debt.[173] The National Flood Insurance Program (NFIP) is a federally underwritten insurance program (managed by FEMA, which is a component

171 Adam B. Smith, "2016: A Historic Year for Billion-Dollar Weather and Climate Disasters in U.S.," NOAA, January 9, 2017, https://www.climate.gov/news-features/blogs/beyond-data/2016-historic-year-billion-dollar-weather-and-climate-disasters-us.

172 Source: Smith, "2017 Disasters."

173 Smith, "2016 Disasters."

of DHS) for private and public property owners in the United States. The NFIP is a federal program largely because of massive and unregulated flood risk across the United States. Of particular concern to the U.S. federal debt is the NFIP's persistent insolvency because of the frequency and severity that flood events are occurring. Following Hurricanes Katrina in 2005 and Sandy in 2012, the NFIP suffered one economic setback after another.[174] Congress forgave much of the debt incurred by these events, but the program has since been wracked by expensive floods; it is once more in debt to the U.S. Treasury by more than $20 billion.[175] Because the premiums paid by policyholders do not cover the full risk in high-risk areas, and certain areas repeatedly soak up the majority of the losses, the debt continues to increase.[176] A similar problem with wind risk in the state of Florida following Hurricane Andrew (in 1992) is another example that shows why state-managed insurance policies exist for hurricane- or wind-related events in high-risk coastal regions. Repetitive losses over time continue to be a financial burden to the Treasury, which is a born by the American taxpayer. Yet cities and towns continue to allow their structures to remain, and continue to build new structures in high-risk areas, creating a complex cycle of disaster.

Unfortunately, the private, for-profit insurance sector does not engage with flood risk. When the risk is greater than the reward, or profit, insurance companies are generally not altruistically compelled to insure investments in high-risk areas. Flood damage to the built environment is the most frequent impact of weather events.[177] Insurance companies know this. The federal government currently has cheaper insurance premiums than the private sector because taxpayers subsidize policyholders' premiums.[178] This is compounded by climate change as the potential risk increases.

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174 Brusentsev and Vroman, *Disasters in the United States*, 112.

175 "Flood Insurance Claims," Huffington Post, January 8, 2018, www.huffingtonpost.com/entry/flood-insurance-claims_us_5a535436e4b0ee59d41c0c41.

176 Brusentsev and Vroman, *Disasters in the United States*, 110.

177 "Flooding: America's #1 Natural Hazard!," FEMA, last updated January 3, 2018, www.fema.gov/news-release/2004/08/16/flooding-americas-1-natural-hazard.

178 Brusentsev and Vroman, *Disasters in the United States*, 110.

Disaster preparedness at the community level is variably funded in advance and likely dependent on yet more federal grants. When disasters strike, state or federal assistance is not guaranteed to be immediate. Federal assistance is predicated on formulas for damage thresholds, determined by Congress.[179] Poor and low-income communities may have significant damage and little way of paying for repairs, but may not meet the damage threshold to receive federal assistance.[180] This can leave entire communities broken and bankrupt, which creates systemic losses in property values and for viable businesses. Not every community—nor every individual—has the financial strength to rely on self-governance and the ability of its people to recover.

Since much global trade is conducted in U.S. currency, it is important for the federal government to maintain the strength of the U.S. dollar. If the United States is not able to recover from catastrophic natural disasters, it signals weakness to our economy and our adversaries. The European and Asian stock markets depend on the strength of the U.S. financial system; if it is perceived that the United States is incapable of handling its financial obligations and must continue to conduct expensive recovery operations, the cascading effect would likely be a global recession.[181] Today, Wall Street is concerned about potential recession over the next several years because of the U.S. debt and inflationary pressures.[182] Consider, for example, the U.S. stock markets and the international market reaction following the attacks of September 11, 2001. The economy in the U.S. sharply shrank well into 2002, and limped toward a near-catastrophic recession in 2008 triggered by faulty lending practices.[183] Cumulative disasters that cost the nation

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179 Stafford Act.

180 Stafford Act.

181 "Climate Security Consensus Project," Center for Climate & Security, September 2016, https://climateandsecurity.files.wordpress.com/2016/09/climate-and-security-consensus-project-statement-2016_09.pdf.

182 Heather Long, "The U.S. Government Is Set to Borrow Nearly $1 Trillion This Year," *Washington Post*, February 3, 2018, https://www.washingtonpost.com/news/wonk/wp/2018/02/03/the-u-s-government-is-set-to-borrow-nearly-1-trillion-this-year/?utm_term=.68a74508b8db.

183 Bryan W. Roberts, "The Macroeconomic Impacts of the 9/11 Attack: Evidence from Real-Time Forecasting" (working paper, DHS, August 2009), https://www.dhs.gov/sites/default/files/publications/Macroeconomic%20impact%209_11%202009.pdf.

billions of dollars year after year—debt that cannot be paid from cash reserves—will create cascading negative consequences.

G. TERRORISM

The chaos and disruption of a natural disaster act as force multipliers for our adversaries' sinister actions. As established in the previous sections, vulnerability to natural hazards can show a nation's momentary or systemic weakness.[184] The speed and effectiveness of government response and recovery actions tell a story that adversaries can exploit. When major disasters strike the United States and our focus is on immediate response needs, our adversaries may find moments of opportunity. As climate change worsens and disasters strike more often, opportunities for deliberate acts of terrorism will increase.[185] As of now, the United States has been fortunate; however, these opportunities can greatly exacerbate an existing natural disaster.

FEMA is the federal government entity responsible for disaster coordination with state, local, tribal, and territorial governments to prevent, respond to, mitigate, protect, and recover from natural, technological, and man-made disasters.[186] During high-demand events, the FEMA workforce becomes stressed to fulfill personnel deployment requirements. A single large event can easily occupy significant staff demands for a year or more; with more concurrent events across the nation, staffing resources are spread thin, with scant ability for rotational relief. DHS, FEMA's parent department, has a voluntary Surge Capacity Force that encourages individuals within all twenty-two components of DHS to willingly work disaster events in order to augment a strained or depleted federal disaster workforce; this shows how overstressed resources become when disasters strike in close timelines.[187] As the frequency and intensity of climate events grow, so does the strain

184 Strategic Foresight Initiative, "Climate Change: Long Term Trends and Their Implications for Emergency Management," FEMA, August 2011, https://www.fema.gov/pdf/about/programs/oppa/climate_change_paper.pdf.

185 Werrell and Femia, "Climate Change."

186 "About the Agency," FEMA, accessed October 25, 2017, https://www.fema.gov/about-agency.

187 "Surge Capacity Force," DHS, accessed December 15, 2016, https://www.dhs.gov/topic/surge-capacity-force.

on resources. Additionally, not all disasters are caused by weather. Earthquakes, tsunamis, and man-made accidents all have the potential for significant damages and major declarations.

Timed right, another large-scale event could tip the economy enough to once again crash stock and commodities markets.[188] Since the declaration of the War on Terror, the U.S. debt limit has spiraled ever higher to support military and other activities.[189] Currently, the United States has reached 103 percent debt-to-gross domestic product, far in excess of the 77 percent acceptable to the World Bank.[190] Considering this economic strain, an overt attack by any enemy during a time of weakness could be catastrophic to the United States. Will world leaders continue to lend trillions of dollars to support a nation that cannot support itself?

Confidence in government is essential for national morale and belief in the capitalist-democratic system. A disaster-weakened national security posture creates an ideal situation for an adversary to incite domestic instability. Russian interference in the 2016 U.S. presidential election should be cause for great alarm; it shows that schemes do not have to be initiated by stateless terrorists, but can come from competitors who are looking for an economic or strategic advantage. Economic stress from disasters and bungled response in the public eye could have an enormous impact on the American people's already fragile confidence in the U.S. government.

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188 Kimberly Amadeo, "How the 9/11 Attacks Still Affect the Economy Today," The Balance, September 11, 2017, https://www.thebalance.com/how-the-9-11-attacks-still-affect-the-economy-today-3305536.

189 Uri Friedman, "Fighting Terrorism with a Credit Card," *Atlantic*, September 12, 2016, https://www.theatlantic.com/international/archive/2016/09/cost-wars-iraq-afghanistan/499007/.

190 Amadeo, "9/11 Attacks."

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IV. PRESIDENTIAL ADMINISTRATIONS AND THE NATIONAL NARRATIVE

> True statecraft is manifest when, in difficult times, we uphold high principles and think of the long-term common good.
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> —Pope Francis, Laudato Si, May 24, 2015[191]

The subject of climate change in the United States is politically volatile—to the detriment of its citizens.[192] The topic's political controversy has affected citizens' understanding of the basic issue, not to mention its drivers and the complex details.[193] The In 2016 the Pew Research Center found that 70 percent of Democrats believe climate scientists' research and its accuracy, while only 15 percent of Republican voters have the same confidence.[194] However, of the same pool of respondents, only 54 percent of Democrats believe these same scientists understand the cause of climate change, versus 11 percent of conservative and 19 of percent moderate Republican voters.[195] This growing disagreement over the past few decades has made climate action a political tool. Both Democrats and Republicans agree that climate scientists act in the public's interest, but 57 percent of conservatives think the scientists are seeking career advancement or are politically motivated.[196]

Doing something about the climate problem is a different matter. The most common dispute skeptics raise is that climate change is not caused by human activity, but is the result of natural phenomena.[197] Conservative politicians insist that the alleged human contribution to a warming planet is overstated, as are any growing weather impacts

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191 Catholic Climate Covenant, accessed August 14, 2018, http://www.catholicclimatecovenant.org/.

192 Gore, *An Inconvenient Sequel*, 229.

193 Funk and Kennedy, "The Politics of Climate."

194 Funk and Kennedy.

195 Funk and Kennedy.

196 Funk and Kennedy.

197 Funk and Kennedy.

stemming from it.[198] While nearly 60 percent of liberal Democrats believe negative environmental effects, such as weather extremes and sea-level rise, will result from climate change, only 20 percent of conservative Republicans hold the same opinions.[199] Indeed, with a majority of conservative Republican voters sensing no real danger, only 29 percent of the same group of voters believes that fossil fuel power plant emissions should be regulated, while nearly three-quarters of liberal Democrats think emission controls are necessary.[200]

Business interests and important economic sectors have considerable influence in shaping climate-related public policy.[201] As representatives of the people, politicians are obligated to represent all home district constituencies, including businesses. Businesses that contribute to the climate problem seek political support to be free from regulatory emission controls, which they believe are too burdensome and will make their businesses less competitive.[202] Others, however, claim that society contributes to global warming and its growing effects/ manufacturing emissions, fossil fuel use for energy production and transportation, and even some food management practices—such as massive feedlots and deforestation—are examples of mankind's contribution to the escalating problem.[203] Proponents of regulation assert that we must urgently limit and reduce CO_2 and other emissions that are leading to dangerous atmospheric changes.[204] Some contend that corporations must be held morally responsible for the security of all life on this planet, which they gamble for capitalistic profit.[205] Most climate scientists predict a dangerous

198 Katie Herzog, "Surprise! A Third of Congress Members Are Climate Change Deniers," Grist, March 8, 2016, http://grist.org/climate-energy/surprise-a-third-of-congress-members-are-climate-change-deniers/.

199 Funk and Kennedy, "The Politics of Climate."

200 Funk and Kennedy.

201 Carlarne, *Climate Change Law and Policy*, 33.

202 Landrigan et al., "The *Lancet* Commission," 6.

203 USGCRP, "National Climate Assessment 2014," sec., "Our Changing Climate."

204 USGCRP.

205 Duncan Clark, "What Is the 'Polluter Pays' Principle?" *Guardian*, July 2, 2012, https://www.theguardian.com/environment/2012/jul/02/polluter-pays-climate-change.

future; we must urgently make societal adaptations, they argue, to offset the unavoidable negative impacts.[206] As natural disasters across the United States become more frequent and intense, comprehensive federal climate change legislation remains elusive.[207] Public dialogue is a necessary part of adaptation.

Climate is a persistent and increasingly important national security concern that requires careful navigation and competent leadership at the helm of the nation.[208] Despite this importance, climate change has not had systemic national doctrine capable of eclipsing personal philosophy. It is an often contradictory issue from presidential administration to administration. This inconsistency in itself is problematic if we seek to attain, and maintain, a whole-of-nation approach to national security. U.S. presidents broadly campaign on issues that, once elected, become a narrative for future doctrine. This is an important entry point; public engagement is needed to expand the dialogue on important national issues. Political capital coming out of an election is capable of transitioning campaign issues into action toward the candidate (or president's) philosophical governance. Climate change is a transcendent problem that has slowly emerged over nearly the past half-century in presidential narratives for national leadership, albeit with varying messaging.

Climate change has been an issue of presidential administrations since the time of Jimmy Carter.[209] In October 1978, Carter signed the National Climate Program Act, signaling the criticality to develop and understand climate science.[210] The subsequent Ronald Reagan and George H. W. Bush administrations supported climate action and policy.[211] However, during the H. W. Bush era, opposition began to grow regarding

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206 "Scientific Consensus: Earth's Climate Is Warming," NASA, accessed December 3, 2016, http://climate.nasa.gov/scientific-consensus/.

207 Carlarne, *Climate Change Law and Policy*, 33.

208 CNA Military Advisory Board, *Risks of Climate Change*, 29.

209 Jimmy Carter, "Memorandum from the President on the National Climate Program," The American Presidency Project, October 31, 1978, http://www.presidency.ucsb.edu/ws/?pid=30082.

210 Carter.

211 Robert A. Wampler, "U.S. Climate Change Policy in the 1980s," National Security Archive, George Washington University, December 2, 2015, https://nsarchive2.gwu.edu/NSAEBB/NSAEBB536-Reagan-Bush-Recognized-Need-for-US-Leadership-on-Climate-Change-in-1980s/.

mankind's contribution to greenhouse gas pollution.[212] In 1989, a private-sector group of primarily oil companies and automakers formed the Global Climate Coalition to counter the notion that greenhouse gases were contributing to climate change, as espoused by Goddard Space Institute Director Hansen.[213] However, shortly before his departure from the White House, Bush signed the United States onto the UNFCCC, and Congress ratified the decision.[214] Meanwhile, the legislative branch of the Republican Party began echoing special interest opposition to regulatory climate policy.[215]

A. THE CLINTON ADMINISTRATION (1993–2001)

Succeeding George H. W. Bush's presidency, in 1993 the Clinton administration sought to leverage the winds of political change to reenergize climate policy. In Clinton's first year in office, he and Vice President Gore released the "Climate Change Action Plan."[216] The plan focused on economic energy policy and mitigating emissions, but did not discuss national security or climate adaptation. Lacking any regulatory teeth, it was an appeal for voluntary action, with targets and milestones, to reverse emissions.[217] The Department of Energy cajoled the energy markets to comply voluntarily, lest more restrictive regulatory measures emerge as a result, and it gained some participation.[218]

Internationally, the Clinton administration was determined to shape global climate change objectives and reinforce cooperative solutions. In the 1995 Berlin Agreement, the first global agreement under UNFCCC, Vice President Gore accepted more stringent policies for developed nations. Essentially, the more mature industrialized countries, including the United States, would carry a larger share of emissions reductions and pricier

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212 Campbell, *Climatic Cataclysm*, 199.

213 Campbell, 199.

214 Carlarne, *Climate Change Law and Policy*, 7.

215 William J. Clinton, *Climate Change Action Plan* (Washington, DC: White House, 1993), https://babel.hathitrust.org/cgi/pt?id=pur1.32754063163632;view=1up;seq=1.

216 Campbell, *Climatic Cataclysm*, 8.

217 Campbell, 8.

218 Campbell, 9.

regulations. He executed this commitment without the agreement of Congress.[219] During this time, Congress was shifting environmental policy toward cost-benefit impacts or market incentives.[220] Congress took Gore's action as the executive branch's dismissal of their economic concerns. Despite the Clinton administration's subsequent efforts to introduce several economic schemes, such as cap and trade and expanding carbon sinks, the rift with Congress became too wide.[221]

Climate divisiveness with Congress beset the second half of the Clinton administration. Vice President Gore continued to advance what the administration believed was an achievable U.S. agenda, including dialogue with the public. They pursued development of the UNFCCC Kyoto Protocol, through which emissions reductions would be reversed to 1990 levels by the year 2000.[222] But Congress had dug in and, as a show of force, the Senate passed a declaration that it would not ratify the Kyoto Protocol—with zero dissenters.[223] Congress contended the Kyoto Protocol would trigger energy prices to escalate in the United States while economically favoring China and India.[224] Although Clinton signed onto the Kyoto Protocol in 1998, the treaty was never received or ratified by Congress.[225]

Despite framing the national narrative on climate change, Clinton's actions were ridiculed by environmentalists as too weak and by industry as too restrictive.[226] Thus, the U.S. government's narrative was not unified. The subject of climate change had become muddied, tense, and confusing in the public domain and lost an opportunity for a solid national doctrine. In the remaining years of the Clinton White House, executive orders on

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219 Carlarne, *Climate Change Law and Policy*, 8.

220 Carlarne, 30.

221 Carlarne, 30.

222 Carlarne, 8.

223 Campbell, *Climatic Cataclysm*, 199.

224 Campbell, 199.

225 Campbell, 9.

226 Carlarne, *Climate Change Law and Policy*, 35.

environmental rules had become Clinton's only path of change until his departure in January 2001.[227]

B. THE GEORGE W. BUSH ADMINISTRATION (2001–2009)

Signaling an unmistakable divergence in presidential narrative from the previous administration, George W. Bush did not address climate change for a full year following his inauguration.[228] In February 2002, the Bush administration released the U.S. Global Climate Change Initiative and the Global Climate Change Policy Book.[229] The policy received few accolades from climate advocates and was considered neutral in advancing the climate change mitigation discussion.[230] Calling for more study, Bush theorized that prosperity would self-correct the atmosphere, and called for emitters to voluntarily reduce the quotient of CO_2 to economic productivity.[231]

By 2005, the Bush administration had assembled the Asia-Pacific Partnership on Clean Development and Climate with six countries to discuss pollution, energy, and climate concerns.[232] In 2007 and 2008, the Major Economies Meeting on Energy Security and Climate Change was also convened at the behest of the Bush administration, eyeing engagement with the United Nations in a move to counterbalance the climate-centric global discussion, to include economic interests and energy sectors.[233] The U.S. position was to reframe greenhouse gas reduction as a target, not binding metrics.

In 2007, the Senate debated America's Climate Security Act of 2007 (S.B. 2191), proposing a cap-and-trade program on fossil fuel emissions in the United States, but was

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227 Carlarne, 30.

228 Carlarne, 37.

229 Carlarne, 37.

230 Carlarne, 37.

231 Carlarne, 38.

232 Larry Parker and John Blodgett, *Global Climate Change: Three Policy Perspectives*, Order Code 98-738 (Washington, DC: Congressional Research Service, 2008), 2, https://fas.org/sgp/crs/misc/98-738.pdf.

233 Parker and Blodgett, 2.

unable to reach consensus on a policy that would not undermine the economy.[234] Recall that the administration's climate policy was released only six months after the 9/11 attacks, when economic conditions were strained.[235] In an analysis by the Heritage Foundation, the bill was strongly denounced for promising "extraordinary perils" for the economy.[236] Congress failed to codify any kind of legislative measures on climate change or global warming. In November 2008, the Congressional Research Service (CRS) prepared a report for Congress titled *Global Climate Change: Three Policy Perspectives*.[237] The report provides a snapshot in time on the status of U.S. climate leadership. It reiterates Bush's 2002 concern that higher climate science consensus was necessary to confirm that climate change is real, and promoted voluntary emission reduction by U.S. economic interests. The report concluded that any forward movement on climate policy would be determined by future policymakers and be dependent upon new science confirming the presence of man-made influence weighted by economic, technological, and ecological considerations.[238] In other words, the debate needed fresh eyes. Bush remained steadfast in his encouragement of global cooperation while avoiding binding agreements that could restrict the economy or American workers.[239] Congressional support to enact any law became mired in partisan divide.[240]

Bush eventually acknowledged the importance of climate change and postulated that global emitters should set emissions reduction goals and come up with a new plan. But the Bush administration never enforced binding agreements on itself.[241]

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234 Odile Blanchard, "The Bush Administration's Climate Proposal: Rhetoric and Reality?," HAL, December 19, 2007, 6, https://halshs.archives-ouvertes.fr/halshs-00199616/document.

235 Blanchard.

236 David Kreutzer et al., "The Economic Costs of the Lieberman-Warner Climate Change Legislation," Heritage Foundation, May 12, 2008, https://www.heritage.org/environment/report/the-economic-costs-the-lieberman-warner-climate-change-legislation.

237 Parker and Blodgett, *Global Climate Change*.

238 Parker and Blodgett, 34.

239 Blanchard, "Rhetoric and Reality," 6.

240 Blanchard, 6.

241 Campbell, *Climatic Cataclysm*, 200.

C. THE OBAMA ADMINISTRATION (2009–2017)

Starting in 2010, the Obama administration included climate change as an unquestionable national security threat. In June 2013, Obama introduced domestic plans to acculturate federal agencies, indeed the nation, to shape the national dialogue on climate change.[242] A comprehensive climate policy, *The President's Climate Action Plan*, detailed numerous far-reaching avenues. The administration pursued state-of-the-art climate research and launched the Climate Data Initiative.[243] Developing new public-facing, open-access websites, it advanced national preparedness using scientific data that was easily accessible and understandable.[244]

Congress, however, did not cooperate with the White House.[245] As Clinton's did during his second term, the Obama White House used executive orders to push climate policy in lieu of cooperative rulemaking. Only a few months following the release of the *Climate Action Plan*, Obama issued *Preparing the United States for the Impacts of Climate Change* (Executive Order 13653), which instructs federal agencies to develop climate adaptation plans using existing pathways, integrating state and local governments and the private sector.[246] Federal agencies reviewed their regulatory statutes to determine how climate adaptation could be leveraged under the scope of their existing programmatic authorities not only internally, but particularly with states, territories, tribes, and local governments. In response, departments and agencies developed climate change vulnerability assessments and impact adaptation plans.[247]

In 2015, the CRS reviewed these climate adaptation plans, summarized the opportunities, and submitted a full-scale review and suggestions for Congressional

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242 Executive Office of the President, *The President's Climate Action Plan*.

243 "Fact Sheet: The President's Climate Data Initiative," White House, March 19, 2014, https://obamawhitehouse.archives.gov/the-press-office/2014/03/19/fact-sheet-president-s-climate-data-initiative-empowering-america-s-comm.

244 Obama, *Impacts of Climate Change*.

245 Mark Hertsgaard, "Obama's Record on Climate Change Provides Lessons for Taking on President Trump," The Nation, December 12, 2016, https://www.thenation.com/article/climate-changed/.

246 Obama, *Impacts of Climate Change*.

247 Leggett, *Climate Change Adaptation*.

consideration.[248] To sum, the CRS extended an invitation for Congress to engage in the climate adaptation initiative. CRS asked Congress to leverage its resources to oversee progress and provide legal guidance to federal agencies, opening the door for congressional guidance, organization, funding, strategies, and performance measures. Specifically, CRS recommended Congress review risks to the federal government, determine cost-benefit considerations and the feasibility of corrective actions, and determine if modifications to agencies' statutory and budgetary authorities were necessary.[249] In August 2015, the Obama administration released the Clean Power Plan, the first document of its kind for reducing carbon emissions. Under the plan, carbon emissions would be reduced by 32 percent by the year 2030 through a combination of coal-powered energy reduction and increases in clean energy sources.[250]

On September 3, 2016, Obama officially signed into the Paris Agreement. This global climate initiative is the successor to the 1997 Kyoto Accord, resolving some key differences that prevented its ratification. It was a signature achievement of the Obama White House, committing the United States to combat climate change.[251]

The Obama administration was a strong leader in the development and pursuit of a new and refreshed national—and global—push toward emissions reduction and renewable energy sources.[252] Reports were developed and issued from top administration officials, such as the Director of National Intelligence, the Department of Defense, and DHS that showed climate change as a serious national security threat to the United States. Climate activists, however, condemned the second-term initiatives as coming too late to solidify legislative change. And the national dialogue would change once again upon Obama's exit from the White House.

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248 Leggett.

249 Leggett.

250 "Climate Change and President Obama's Action Plan," White House, accessed June 13, 2018, https://obamawhitehouse.archives.gov/node/279886#section-clean-power-plan.

251 Tanya Somander, "President Obama: The United States Formally Enters the Paris Agreement," September 3, 2016, https://obamawhitehouse.archives.gov/blog/2016/09/03/president-obama-united-states-formally-enters-paris-agreement.

252 Somander.

D. THE TRUMP ADMINISTRATION (2017–PRESENT)

Donald J. Trump, newly inaugurated in January 2017, had only superficially signaled how his administration would approach climate change. During the campaign, Trump was skeptical that the climate was changing at all, though he did express concern about the impact climate change has on business interests and American competitiveness in global markets.[253] In 2012, years before his inauguration would take place, Trump claimed through social media, tweeting that "the concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive."[254] This mindset has defined the Trump narrative on climate change, which was reflected more recently in his December 28, 2017, tweet: "In the East, it could be the COLDEST New Year's Eve on record. Perhaps we could use a little bit of that good old Global Warming that our Country, but not other countries, was going to pay TRILLIONS OF DOLLARS to protect against. Bundle up!"[255] According to one researcher, Trump has tweeted about his climate skepticism in more than one hundred messages.[256] David S. Ferriero, archivist of the United States at the U.S. National Archives, confirmed that all tweets since the president's inauguration are considered official presidential records, according to the Presidential Records Act of 1978.[257] Additionally, in separate court cases, two judges ruled

253 Juliet Eilperin, "Trump Says 'Nobody Really Knows' if Climate Change Is Real," *Washington Post*, December 11, 2016, https://www.washingtonpost.com/news/energy-environment/wp/2016/12/11/trump-says-nobody-really-knows-if-climate-change-is-real/?utm_term=.5bd1295a956b.

254 Donald J. Trump (@realDonaldTrump), "The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive," Twitter, November 6, 2012, 11:15 a.m., https://twitter.com/realDonaldTrump/status/265895292191248385.

255 Donald J. Trump (@realDonaldTrump), "In the East, it could be the COLDEST New Year's Eve on record. Perhaps we could use a little bit of that good old Global Warming that our Country, but not other countries, was going to pay TRILLIONS OF DOLLARS to protect against. Bundle up!," Twitter, December 28, 2017, 4:01 p.m., https://twitter.com/realdonaldtrump/status/946531657229701120?lang=en.

256 Dylan Matthews, "Donald Trump Has Tweeted Climate Change Skepticism 115 Times," Vox, June 1, 2017, https://www.vox.com/policy-and-politics/2017/6/1/15726472/trump-tweets-global-warming-paris-climate-agreement.

257 Ali Rogin and Veronica Stracqualursi, "National Archives Advises White House to Preserve All Trump Tweets, Including Deleted Ones," ABC News, April 4, 2017, https://abcnews.go.com/Politics/national-archives-advises-white-house-preserve-trump-tweets/story?id=46570319.

presidential tweets are official statements of records.[258] Outside of Twitter, the Trump administration has made no official statement on climate change doctrine. However, the administration's actions indicate intent to weaken, and more broadly eliminate, climate initiatives.[259]

In March 2017, Trump signed Executive Order 13783, which rescinded the Clean Power Plan, the *President's Climate Action Plan*, *Preparing the United States for the Impacts of Climate Change*, and the presidential memorandum on "Climate Change and National Security" issued in 2016, as well as other leadership actions on climate mitigation and adaptation.[260] After Trump signed the new executive order, an unnamed White House official cited India and China as examples of economic prosperity working to protect the environment.[261] The comment is reminiscent of the George W. Bush dogma that a thriving economy would naturally guard against climate change.[262] The veracity of these claims, however, could not be verified.

By August 2017, the Climate Science Advisory Committee, which provides the *National Climate Assessment Report*, was officially disbanded within the National Oceanographic and Atmospheric Administration.[263] Incidentally, two weeks before Hurricane Harvey ravaged the Gulf Coast of Texas, Trump signed an executive order revoking stronger standards on federal infrastructure and rescinding the *Federal Flood Risk Management Standard* that required future flood risk to be considered when any federal

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258 Knight First Amendment Institute at Columbia University v. Donald J. Trump, Hope Hicks, Sarah Huckabee Sanders, and Daniel Scavino (2018), U.S. Dist. Ct., Southern District of New York, 17 Civ. 5205 (NRB), https://knightcolumbia.org/sites/default/files/content/Cases/Wikimedia/2018.05.23%20Order%20on%20motions%20for%20summary%20judgment.pdf; State of Hawai'I v. Donald J. Trump, U.S. Court of Appeals, No. 17-15589 (2017), http://cdn.ca9.uscourts.gov/datastore/opinions/2017/06/12/17-15589.pdf.

259 Columbia Law School, "Climate Deregulation Tracker."

260 Trump, *Promoting Energy Independence*; "Trump Issues Executive Order on Climate Change," Columbia Law School, March 28, 2017, http://columbiaclimatelaw.com/climate-deregulation-tracker/trump-issues-executive-order-on-climate-change/.

261 Dan Merica, "Trump Dramatically Changes U.S. Approach to Climate Change," CNN, March 29, 2017, http://www.cnn.com/2017/03/27/politics/trump-climate-change-executive-order/.

262 Carlarne, *Climate Change Law and Policy*, 38.

263 Columbia Law School, "Trump Issues Executive Order."

funds were utilized in infrastructure or other development.[264] In November 2017, Trump abandoned the United States' commitment to the Paris Agreement.[265] Today, the United States singularly refuses to join the Paris Agreement—an agreement that Trump believes it is damaging to American economic interests.[266] In December 2017, the Trump administration's first National Security Strategy was released, and it notably departs from the previous administration's discussion on climate change.[267] Climate change is not mentioned as a national security threat.

As of May 2018, Trump has not filled the science advisor vacancy in his administration.[268] Without strong leadership in the White House, science is believed to be unrepresented in the executive branch's decision-making process, amid additional concerns that federal scientific program funding has been cut or eliminated, including funding for NASA's Carbon Monitoring System.[269] The White House contends it has increased the 2018 budget by 2 percent over the previous year, and argues that it is reducing duplicative programs.[270]

Climate change information has been removed from federal websites, and civil service scientists have been replaced by political appointees in key science decision–making areas.[271] The Trump administration's image has suffered in the science community, having issued ninety-six executive orders and legislative or policy changes to reverse or

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264 "President Issues Executive Order to Expedite Infrastructure Reviews, Revoke Flood Management Standard," Columbia Law School, August 15, 2017, http://columbiaclimatelaw.com/climate-deregulation-tracker/president-issues-executive-order-to-expedite-infrastructure-reviews-revoke-flood-management-standard/.

265 William A. Galston et al., "Trump's Paris Agreement Withdrawal: What it Means and What Comes Next," Brookings, June 1, 2017, https://www.brookings.edu/blog/planetpolicy/2017/06/01/trumps-paris-agreement-withdrawal-what-it-means-and-what-comes-next/.

266 Carlos Ballesteros, "The U.S. Is Now the Only Country Not in the Paris Climate Agreement," *Newsweek*, November 11, 2017, http://www.newsweek.com/trump-paris-climate-agreement-syria-703765.

267 President of the United States, *National Security Strategy* 2017.

268 Charles S. Clark, "Science in the Age of Trump," Government Executive, May 18, 2018, https://www.govexec.com/technology/2018/05/science-age-trump/148307/?oref=skybox.

269 Clark.

270 Clark.

271 Clark.

modify climate or environmental sustainability policy in eighteen months; eighty-six of them in 2017 alone.[272] In the absence of a formal doctrine on climate change, these actions indicate a national dialogue that formal policy has not.

E. SUMMARY

The topic of climate change has become so divisive in the United that it is difficult to have rational debates leading to decisions and, thus, actions. Creating a resilient future first begins with a state of unity that is not possible to construct quickly. This chapter captures only the most critically defining climate-related policies of U.S. presidential administrations over the last several decades, including swings in U.S. leadership over time. To understand the climate threat, it is foundational to also understand how scientists and policymakers perceive its risk to society over time. In conducting this research, it became apparent that the political leadership in the United States has various beliefs about the topic itself that directly affect national philosophy and a steady path forward.

Inconsistency in climate doctrine from administration to administration destabilizes the public's ability to understand the breadth or depth of the threat. Furthermore, the reversal of policies based on presidential narratives every eight years does not allow meaningful policy progress against a growing national security threat, particularly as illustrated by the Obama–Trump administration differences reviewed in this chapter. To reverse the intensifying impacts of climate change, we must make changes to human behavior that will take much longer to achieve than the speed at which climate impacts are occurring.[273] The exploration of presidential narratives calls into question the urgency of sustained leadership on a critical issue.

272 Columbia Law School, "Climate Deregulation Tracker."

273 USGCRP, "National Climate Assessment," sec., "Our Changing Climate."

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V. LAWS, REGULATIONS, AND POLICIES

A people that values its privileges above its principles soon loses both.

—Dwight D. Eisenhower[274]

As natural disasters grow in frequency and severity, disaster losses are becoming increasingly unsustainable.[275] Federal policymakers are concerned about the mounting costs and the growing federal deficits, and their decisions play an important role in providing intelligent and consistent guidance to federal, state, and local officials.[276] Three key areas policy areas are central to this discussion: emergency management regulations and policy, land use, building codes. To become a disaster-resilient nation, we must explore current resilience policies and preventative measures—including those for sustainable growth and development. Particularly, it is important to review policies that control how land is being used, how it is developed, who makes those decisions, the guidelines for them, and safe thresholds for the U.S. economy.[277] Building codes are equally important as they determine our buildings' structural integrity to withstand weather extremes.[278] Disasters will continue to happen; when they do, these regulations and policies guide federal disaster assistance. But do the policies consider the threat of increased climate-related impacts?

A. EMERGENCY MANAGEMENT

The Robert T. Stafford Disaster Relief and Emergency Assistance Act guides federal emergency management assistance to states, territories, tribes, and communities after disasters.[279] Federal assistance is provided through specific programs, as allowed for

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274 Dwight D. Eisenhower, First Inaugural Address, January 20, 1953, The Avalon Project, http://avalon.law.yale.edu/20th_century/eisen1.asp.

275 Papadopoulos. *Resilience*, 63.

276 Brusentsev and Vroman, *Disasters in the United States*, 43.

277 Brusentsev and Vroman, 71.

278 Brusentsev and Vroman, 71.

279 Stafford Act.

by law. Although the programs are codified, their processes can be subjective to interpretation and application at the regional level, as long as the programmatic outcome is objective. While straightforward, the federally underwritten National Flood Insurance Program (NFIP) routinely faces three controversies. First: the program enables more flood disasters to happen by allowing structures to be built in floodplains and other known flood-risk areas.[280] Second, policyholders in some of the country's highest flood-risk areas receive government subsidies through reduced premiums.[281] Third, as previously mentioned, the NFIP owes $23 billion to the U.S. Treasury due to Hurricanes Katrina and Sandy.[282] With this in mind, it is incredible that, according to the GAO, floods comprise 99 of U.S. disasters, and only 14 percent of homeowners hold flood insurance policies.[283]

The public has misperception that, when disaster strikes, FEMA can rescue victims immediately and help them return their livelihoods to pre-disaster status. In reality, FEMA can provide only limited basic services and assistance to help disaster victims; this level of assistance cannot restore normality for all those affected. Federal disaster assistance is divided into several categories—primarily: individual assistance, public assistance, and mitigation.[284] These programs help restore most public infrastructure, help people with temporary housing, and provide small cash payments to help survivors to restart their lives.[285] A minimum of 75 percent of public assistance grants help municipalities restore public infrastructure damaged in the disaster, such as water treatment and wastewater facilities; fire and police stations; city-, county-, or state-owned buildings; roads and bridges; and other infrastructure.[286]

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280 Katie Worth and Dan Nolan, "Can FEMA's Flood Insurance Program Afford Another Disaster?" PBS, May 24, 2016, http://www.pbs.org/wgbh/frontline/article/can-femas-flood-insurance-program-afford-another-disaster/.

281 Brusentsev and Vroman, *Disasters in the United States*, 115.

282 GAO, *Progress on Many High-Risk Areas, While Substantial Efforts Needed on Others*, GAO-17-317 (Washington, DC: GAO, 2017), http://www.gao.gov/highrisk/national_flood_insurance/why_did_study.

283 Worth and Nolan, "FEMA's Flood Insurance Program."

284 Kreiser, Mullins, and Nagel, *Federal Disaster Assistance*, 1.

285 Kreiser, Mullins, and Nagel, Table of Contents.

286 Kreiser, Mullins, and Nagel, 7.

Misuse of federal funds is always a concern.[287] The Individual Assistance Program has also not escaped scrutiny for waste, fraud, and abuse. Because FEMA manages large sums of money under critical stress and suboptimal conditions, the Office of the Inspector General audits its programs. In a 2015 inspection, the Inspector General audited fifty-five grants and eight programs; they found a "29 percent questioned-cost rate," which means that one-third of the grants issued by these programs were potentially wasted expenditures in the Disaster Relief Fund.[288] Averaging $10 billion annually, a 29-percent questioned cost-rate equates to approximately $3 billion in improper disaster-related expenditures, which could include, "duplicate payments, unsupported costs, improper contract costs, and unauthorized expenditures."[289]

FEMA has proposed a disaster deductible option that would incentivize states to invest in their own resilience measures and reduce the federal burden on disaster reconstruction.[290] Essentially, states that use this option would earn credits against a deductible, similar to insurance. Currently, the Stafford Act and its amendments provide significant taxpayer assistance to restore roads, bridges, and other public infrastructure that are damaged or destroyed due to disasters.[291] These expenditures suggest that there are higher taxpayer subsidies for disaster recovery than through private insurance or other resources.[292] Incentives may help provide insurance for these structures since the Stafford Act pays the majority of the costs to replace them.

Could disasters be prevented by increased accountability or other incentives? This is an important question to ask, considering the risks of climate change. With proper

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287 DHS Office of Inspector General (OIG), *Audit Tips for Managing Disaster-Related Project Costs*, OIG-16-109-D (Washington, DC: DHS, 2016).

288 DHS OIG, *Summary and Key Findings of Fiscal Year 2015 FEMA Disaster Grant and Program Audits*, OIG-17-13-D (Washington, DC: DHS, 2016), https://www.oig.dhs.gov/sites/default/files/assets/2017/OIG-17-13-D-Dec16.pdf.

289 DHS OIG.

290 Joel Scata, "A More Resilient Future: FEMA's Public Assistance Deductible," National Resources Defense Council, April 14, 2017, https://www.nrdc.org/experts/joel-scata/more-resilient-future-femas-public-assistance-deductible.

291 Brusentsev and Vroman, *Disasters in the United States*, 5.

292 Brusentsev and Vroman, 43.

maintenance, structures are designed with an average useful lifespan of thirty to fifty years. As natural hazards intensify, the Stafford Act does not consider increased threats for post-disaster repairs or replaced infrastructure.[293] The Disaster Relief Fund will pay to replace the damaged or destroyed infrastructure to pre-disaster condition (using current codes); however, functional authority rests with FEMA to apply additional funds under section 406 of the Stafford Act to refine the original infrastructure to withstand increased impacts.[294] At the time of this writing, statistics were unavailable for rating the percentage of FEMA public assistance projects that receive 406 mitigation.

B. LAND USE

Land use planning and zoning are largely locally controlled practices.[295] Historically, most land owners have had freedom to build at will—until the 1960s, when some land use controls started to emerge.[296] Today, land use controls are in place in most local jurisdictions across the United States, though they are spotty, inconsistent, and largely unregulated.[297] Several constitutional provisions and federal regulations or policies interact with local land use or allow federal agencies to have some specific jurisdictional authority.[298] While the Constitution provides states with the primary authority to govern, restrict, guide or direct land use policy at the local level, state governments delegate that authority to the municipal level, within state law.[299] Although local jurisdictions develop and utilize land use plans and comprehensive plans supporting growth and development, there are no laws governing the intersection of land use and natural hazard areas beyond environmental damage. Federal programs can incentivize local jurisdictions to comply

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293 Federal Disaster Assistance, 44 C.F.R. § 206 (2011).

294 "9526.1 Hazard Mitigation Funding under Section 406 (Stafford Act)," FEMA, last updated February 12, 2015, https://www.fema.gov/95261-hazard-mitigation-funding-under-section-406-stafford-act.

295 Edward Glaeser, "Reforming Land Use Regulations," Brookings, April 24, 2017, https://www.brookings.edu/research/reforming-land-use-regulations/.

296 Glaeser.

297 Glaeser.

298 Glaeser.

299 Glaeser; Nolon, "American Land Use System."

with new or changing restrictions, but local control reigns. For example, only twelve states have voluntarily adopted the International Zoning Code.[300] Unfortunately, this means local governments often stop short of long-range growth and development planning, as it relates to hazard areas intrinsic to the region.[301]

As urban areas grow, land becomes more expensive, and new development encroaches further and further into more risk-averse areas. Bigger populations require more local investment in emergency management, but this can be controlled when using smart growth mitigation practices.[302] For example, siting future land use below a large high-hazard dam is an undertaking worthy of extra vigilance by municipal land use planners and local elected leaders. As acknowledged by its designation as a "high-hazard" dam—which means loss of life is possible if the dam fails—the dam represents a specific risk.[303] Of the more than 90,000 dams in the United States with a median age of fifty-six years, more than 15,000 are classified high-hazard.[304] Figure 17 shows the locations of high-hazard dams across the country. These data reveal that at least 15,000 communities are located beneath a high-hazard dam. As municipalities determine appropriate land use for their community's growth and development (e.g., high-density single and multi-family residential neighborhoods, landfills, commercial and industrial uses, hazardous waste, etc.) the location of the high-hazard dam should be extremely important simply due to the amount of water stored behind the dam.[305] Most are earthen, and all are human-engineered. While dam breaches are considered low-probability, high-consequence events, a high-hazard classification means that, even if it is not likely to break, if it does people will die.

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300 "International Code Council Code Adoption Map," accessed September 26, 2017, www.iccsafe.org/wp-content/uploads/Code_Adoption_Maps.pdf.

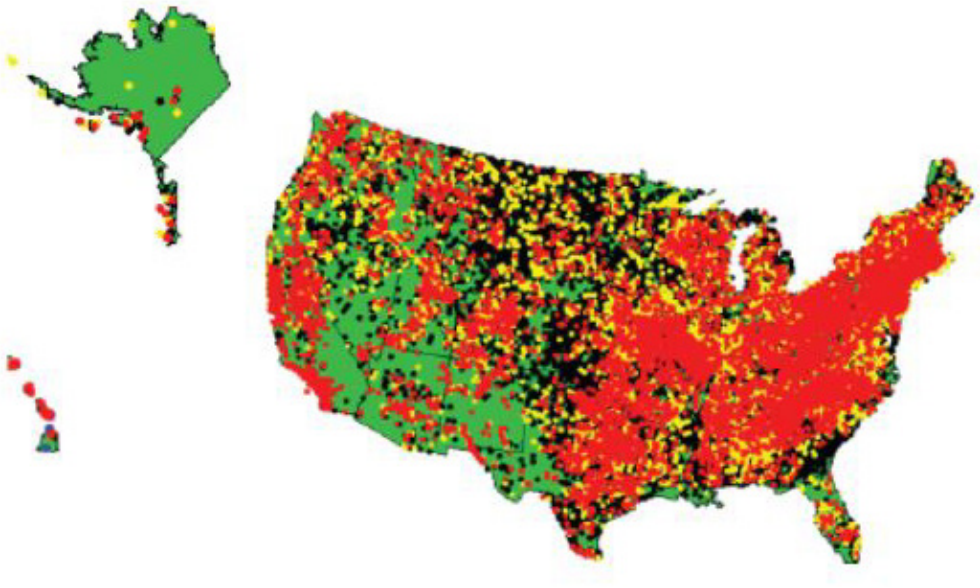
301 Nolon, "American Land Use System."

302 Papadopoulos, *Resilience*, 24.

303 "CorpsMap National Inventory of Dams," U.S. Army Corps of Engineers, accessed September 25, 2017, http://nid.usace.army.mil/cm_apex/f?p=838:1:0::NO::APP_ORGANIZATION_TYPE,P12_ORGANIZATION:15.

304 "National Inventory of Dams: 2016 Inventory," U.S. Army Corps of Engineers, accessed September 25, 2017, http://www.publications.usace.army.mil/Portals/76/Publications/EngineerPamphlets/EP_360-1-23.pdf?ver=2016-12-21-154355-163.

305 Lake Oroville Dam storage capacity is 3.5 million acre-feet of surface water. See Wikipedia, s.v. Lake Oroville Dam, accessed October 16, 2017, https://en.wikipedia.org/wiki/Oroville_Dam.



High-hazard dams are illustrated in red, significant-hazard dams are yellow, and low-hazard dams are black.

Figure 17. Dams in the United States by Hazard Classification[306]

The 2016 Oroville Dam spillway is a perfect example.[307] Following years of exceptional drought, California was inundated with rains and upstream snowmelt–as much as 150 percent more than usual. Expansion and contraction of the earthen dam and concrete spillways corrupted the integrity of the concrete, allowing the water to exploit minor cracks into critical structural failure of the primary and auxiliary spillways.[308] Soon, more than 187,000 residents below the dam were in danger and had to be evacuated.[309] Luckily, following quick actions by dam operators and a miraculous reduction of rain, stress was reduced on the system, the dam did not fail, and no lives were lost.

306 Source: National Research Council, "Current Dam and Levee Infrastructure, Management, and Governance," in *Dam and Levee Safety and Community Resilience: A Vision for Future Practice* (Washington, DC: National Academies Press, 2012), 49, https://www.nap.edu/read/13393/chapter/5#51.

307 David A. Graham, "How Did the Oroville Dam Crisis Get So Dire?," *Atlantic*, February 13, 2017, https://www.theatlantic.com/national/archive/2017/02/how-did-the-oroville-dam-get-so-bad/516429/.

308 Graham.

309 Graham.

High-hazard dams are required to have Emergency Action Plans and Inundation Zones that identify downstream risk should a dam failure occur, and outline preparedness and emergency actions.[310] Not all do, however. Furthermore, an inundation map that identifies potential velocity, scope, or depth of rising water is recommended, but not required. In the absence of an inundation map, dam safety officials may be uncertain how to quantify impacts to inform preparedness planning and actions. Consider, also, that many dams are old and the personnel, materials, and equipment needed to maintain them are persistently difficult to procure.[311] The American Society of Civil Engineers estimated that $3.3 trillion in federal funds are necessary to replace aging infrastructure over the next ten years—something the dam hazard classifications do not take into consideration.[312]

There is no readily available literature about the regulatory connection between municipal growth and development below these dams. Rhetorically, however, it is reasonable to consider: Do residents realize locations of nearby dams or potential dam threats when choosing a place to live, or when thinking about local shopping or entertainment, such as cinemas and restaurants? If so, do they know whom to ask? Only those few individuals aware of the voluntary FEMA-approved Hazard Mitigation Plan would be wise enough to ask if their community has one and when it was last updated. Hazard Mitigation Plans are comprehensive documents that communities develop, and that receive FEMA and state approval when they meet specific guidelines.[313] The plan includes information about how the community plans land use in hazard areas. From a regulatory perspective, accountability is likely dependent upon post-disaster impacts and investigative forensics.

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310 FEMA, *Federal Guidelines for Dam Safety*.

311 Casey Williams, "America's Crumbling Dams Are a Disaster Waiting to Happen," Huffington Post, May 18, 2016, http://www.huffingtonpost.com/entry/america-crumbling-dam-infrastructure_us_573a332be4b08f96c183deac.

312 Williams; National Academies Press. National Research Council, "Current Dam and Levee Infrastructure," 55.

313 FEMA, *Local Mitigation Planning Handbook* (Washington, DC: DHS, 2013), www.fema.gov/media-library-data/20130726-1910-25045-9160/fema_local_mitigation_handbook.pdf.

C. BUILDING CODES

The public expects that homes and businesses are built according to local building codes, are appropriately permitted, and undergo occupancy safety certifications. Structures should be safe to live and work in without unreasonable fear of catastrophe. This is the basic tenet of the government contract with its citizens: in exchange for paying taxes and abiding by the law, the government will provide safety.[314] Disasters prove, however, that this is not enough.[315] Land use policy and building codes in the United States are controversial, and may be insufficient against the strengthening forces of Earth's natural weather systems.[316]

Why have historical climate threats repeatedly destroyed communities in the United States? One or more of the following is happening: the buildings are under far too much stress against strengthening weather impacts, buildings codes and reliability standards are under-rated or inadequate, or population/economic growth pressures communities to make hazardous areas available for development. Building codes in the United States are designed based on past events, known as model codes.[317] Model codes are not state or locality specific. As climate change intensifies weather impacts, the existing building stock and codes are insufficient to withstand increased damage.[318]

For many, the "American Dream" means having freedom to chase wealth, education, a career, family life, and home ownership. When it comes to home ownership, in 2016, 6 percent of the U.S. gross domestic product originated through real estate construction.[319] The record is 8.9 percent in 2006, just before the mortgage sector meltdown of 2008.[320] Nearly 2 million jobs are created by the housing market, which makes it big

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314 Papadopoulos, *Resilience*, 87.

315 Papadopoulos, 34.

316 Papadopoulos, 63.

317 GAO, *Climate Change*.

318 GAO, 24.

319 Kimberly Amadeo, "How Does Real Estate Affect the U.S. Economy?" The Balance, June 10, 2017, https://www.thebalance.com/how-does-real-estate-affect-the-u-s-economy-3306018.

320 Amadeo.

business for the national economy.[321] Remarkably, according to the International Code Council, all U.S. states adopted the International Building Code and the International Residential Code, with the exception of Wisconsin.[322] Yet housing appears to be a disposable commodity.[323] This multi-trillion-dollar asset in the U.S. economy has a dark side, full of contradictions, that makes it a drain on the nation's financial and natural resources.[324]

According to "affordability theory," weaker building (and land use) codes help create affordable homes.[325] The catch is that the structures are cheap and weak but, unfortunately, the affordability is critical for those who can least afford disaster recovery.[326] Affordability theory suggests that homeowners or purchasers who can afford a more expensive structure buy better quality and resilience. Less-stringent building codes result in increased disaster losses. Insured losses are paid by the underwriter, and uninsured losses are partially paid by the federal government for public buildings, or extremely low interest loans borne by the survivor who can least afford it, help from the American taxpayer, or philanthropic organizations.[327] This is the crux of the problem: the cycle of damage-reconstruction-damage is unsustainable. Comparing the unpredictability and intensity of climate change effects and the local community's adaptive capacity to withstand such events, the timing of this issue is of critical importance.

The United States spends billions of dollars in homeland disaster assistance and recovery—catastrophic burdens that, as previously mentioned, are not budgeted for.[328] Prior to 2017, the most expensive year in terms of disaster losses was 2005, mostly due to

321 Papadopoulos. *Resilience*, 69.

322 International Code Council, "Code Adoption Map."

323 Papadopoulos, *Resilience*, 63.

324 Papadopoulos, 25.

325 Papadopoulos, 63.

326 Papadopoulos, 88.

327 Papadopoulos, 63.

328 Brusentsev and Vroman, *Disasters*, 44–49.

Hurricanes Katrina, Rita, and Wilma, with losses of $215 billion.[329] However, 2017 eclipsed that notorious year of storms with another trio of intense Atlantic hurricanes: Harvey, Irma, and Maria.[330] The combined estimate for all weather-related disasters in 2017 was $306 billion, making it the costliest year for disasters in U.S. history.[331] This illustrates a growing imbalance between anticipated weather and natural hazards and the quality of the built environment to withstand those hazards.

According to a GAO study, the organizations responsible for developing building codes do not use climate predictive analytics.[332] Additionally, not each entity even regularly updates climate information when reaching determinations on recommended code changes.[333] For example, temperature data from a thirty-year period before 1991 is used to identify climate insulation needs. Data coordination is problematic. Little interaction takes place between code-developing organizations and federal agencies such as NOAA or FEMA that can share climate analytics. The GAO found that the organizations are ambivalent to this data.[334] There appears to be no leadership authority within the code council system; it is, rather, a group of industry special interest groups that develop the building code system.[335]

Because there is no mandate for building codes in the United States, states generally adopt the minimum International Code Council standards. There is no accountability. Local jurisdictions can "localize" codes even further.[336] Building codes are an intrinsic part of our national identity and safety, yet it appears there are some significant gaps in the crossroads between building codes and disasters in the United States.

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329 "Assessing the U.S. Climate in 2017," NOAA, January 5, 2018, www.ncei.noaa.gov/news/national-climate-201712.

330 NOAA.

331 NOAA.

332 GAO, *Climate Change*, 14.

333 GAO, 14.

334 GAO, 17–20.

335 Papadopoulos, *Resilience*, 52.

336 Papadopoulos, 53.

D. SUMMARY

The way local jurisdictions zone and permit their land use for development is largely unregulated and lacks accountability. The same can be said for building codes. After Hurricane Andrew destroyed South Florida communities in 1992, the Miami-Dade government revised its residential building codes; they are now some of the strictest in the nation.[337] Soon, other Florida counties adopted their codes, and eventually so did the state—followed by some other states, as well. Codes and land use provide clear guidance derived from previous failed structures or protocols. Local and state governments could create restricted minimum standards to ensure increased stability and resilience.[338]

337 Mike Tsikoudakis, "Hurricane Andrew Prompted Better Building Code Requirements," *Business Insurance Journal*, August 19, 2012, https://www.businessinsurance.com/article/20120819/NEWS06/308199985.

338 Brusentsev and Vroman, *Disasters in the United States*, 71.

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VI. CLIMATE ADAPTATION IN THE UNITED STATES, EUROPEAN UNION, AND CANADA

It ain't about climate change anymore, it's about climate adaptation.

—Craig Fugate, former FEMA Administrator
September 8, 2017[339]

Before diving into a discussion about adapting to climate change, it is important to explain what *adaptation* means as it applies to climate. Although the terms *adaptation* and *mitigation* are often mentioned in the same discussion on risk reduction, they are not interchangeable; in many ways, these terms reflect opposite sides of the same problem. Mitigation addresses the front end—where human intervention may be able to stop the core triggers that are changing the climate in the first place, such as curbing emissions.[340] Adaptation addresses the consequential side of the same problem; it focuses on preparing for the outcome, or adapting human civilization to predicted impacts of climate change. For example, adaptation could mean building bigger and stronger infrastructure, genetically modifying food crops to withstand drought, elevating homes against sea-level rise, and other actions that secure the human environment. The global scientific community realizes that mitigation is now completely reactive; long-term action is needed to reverse the atmospheric damage that has already been done.[341] The objective is that over time, through various societal changes and technological advancements, the human environment can mitigate damaging emissions pathways to reduce harmful atmospheric CO_2 levels. However, the negative impacts of climate change are readily measureable. So, in the

339 Josh Delk, "Former FEMA Chief: It's Not about Climate Change Anymore, 'It's about Climate Adaptat6ion,'" *The Hill*, September 8, 2017, http://thehill.com/blogs/blog-briefing-room/349785-former-fema-director-its-not-about-climate-change-its-about-climate.

340 C. B. Field et al. (eds.), "Glossary of Terms," in *A special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC)* (Cambridge, UK: Cambridge University Press, 2012), 561, https://www.ipcc.ch/pdf/special-reports/srex/SREX-Annex_Glossary.pdf.

341 Dyer, *Climate Wars*, xiii.

meantime, the human environment must adapt to the observed impacts and prepare for future ones.

This chapter explores the ways the United States, the European Union, and Canada are attempting to adapt to the changing climate. The threats of climate change—which affect every country on the planet—are perceived through a unique regional lens. Each region is different in geography and biology, as well as in human environment and education governance, and transparency all play a role in perception and eventual action. There is no straightforward path to climate resilience. Personalities and philosophies are as important as national culture and economies in influencing how nations respond to the threat. In this broad exploration, the United States, European Union, and Canada are similar in that they are all Global North nations. They share seasoned post-industrial democracies that are stable, privileged to have economies of scale, and capable of addressing climate challenges. All are active in the international arena and members of the United Nations.

The United Nations has advanced the global climate change discussion since 1992, and in 1994 officially adopted the United Nations Framework Convention on Climate Change (UNFCCC).[342] The UNFCCC is a diplomatic global body that continues to be an important operative tool for unifying global climate action.[343] The UNFCCC established working relationships with member nations, including the United States, to reduce damaging emissions through goal setting and benchmarking achievements.[344] Member nations have met annually at the Conference of the Parties twenty-three times. The Conference of the Parties has made great strides, advancing numerous global concerns including climate change.[345] The first global partnership to curb harmful human activities

342 "Background on UNFCCC," accessed September 27, 2017, http://unfccc.int/essential_background/items/6031.php.

343 UNFCCC.

344 "First Steps to a Safer Future," UNFCCC, accessed June 20, 2017, http://unfccc.int/essential_background/convention/items/6036.php.

345 "Conference of the Parties (COP)," UNFCCC, accessed June 20, 2017, http://unfccc.int/bodies/body/6383.php.

was the previously discussed Kyoto Protocol in 1997, which set timeframes toward risk reduction.[346]

A. THE UNITED STATES

In discussing the challenge of climate adaptation in the United States, we must first recall the factors that interfere with national consensus. Briefly, as discussed previously, a significant portion of the U.S. political system dismisses that changes in the climate are linked to human activity—which includes emissions from burning fossil fuels (coal, oil, natural gas), food production, and the ongoing use of certain gases, such as refrigerant in air conditioners. The scientific community, however, claims that fossil fuels are the main contributor to the concentration of climate-altering chemicals in the Earth's atmosphere, primarily CO_2. The U.S. fossil fuel industry and other oil-dependent industries are influential in the country's political system and have successfully obscured climate science making it a protracted political and public issue.[347] These disputes focus on proof of human contribution, the cost of mitigation, and the market impacts of curbing emissions, which could result in profit losses for powerful multi-national corporations, as well as potential job losses. Climate adaptation is thus a sticking point for legislators.

There was a time when the United States led the world in the field of environmental regulation: beginning in the 1970s, the U.S. government was on the forefront of environmental law and policy.[348] The United States consistently developed progressive data and scientific advancements, championing global climate change mitigation and adaptation.[349] As early as 1974, the United States and the European Union joined forces as leaders of a new era in combating climate impacts from industrialization.[350] This did not change until the George W. Bush presidency (2001–2009), when the political parties became deeply biased and progress was stymied, especially amid refusal to ratify the Kyoto

346 Carlarne, *Climate Change Law and Policy*, 241.

347 Gore, *An Inconvenient Sequel*, 179–180.

348 Carlarne, *Climate Change Law and Policy*, 21, 249.

349 Carlarne, 250.

350 Carlarne, 13.

Protocol, which was largely envisioned and negotiated by former Vice President Gore.[351]. Special interest groups and financial establishments in the United States had gained more federal decision–making influence on environmental issues with state politicians.[352] These interests overshadowed local or state concerns, and the lack of unity and consistency increased tension stateside and internationally.[353]

The United States was behind global initiatives when the Obama administration made significant headway to align climate direction and unify the nation. Throughout both of his terms, Obama persistently assembled a climate change infrastructure through the executive branch, directing federal agencies to develop climate adaptation plans. His guidance also sought to make the climate issue transparent using state-of-the-art equipment, access, and public openness to guide decision making. Signed on August 29, 2016, the Paris Agreement marked the culmination of Obama's effort to plant the United States as a global climate agreement participant; its adoption was his signature moment in bringing the United States to the world climate initiative.[354] In an effort to bring all federal agencies on board with the detailed national security threats reported by the intelligence and defense sectors, Obama issued a memorandum on "Climate Change and National Security" on September 21, 2016.[355] It created a detailed performance plan for climate impacts to be considered in all federal policies, doctrine, and national security matters to initiate actions toward fulfilling obligations in the Paris Agreement.

Within six months of signing the Paris Agreement, U.S. leadership changed significantly when Trump was elected president.[356] In the first three months of his

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351 Carlarne, 240, 243.

352 "Senators Call Out Web of Denial Blocking Action on Climate Change," U.S. Senate, July 25, 2016, https://www.whitehouse.senate.gov/news/release/senators-call-out-web-of-denial-blocking-action-on-climate-change.

353 Carlarne, *Climate Change Law and Policy*, 33.

354 Somander, "President Obama."

355 "Presidential Memorandum—Climate Change and National Security," White House, September 21, 2016, https://obamawhitehouse.archives.gov/the-press-office/2016/09/21/presidential-memorandum-climate-change-and-national-security.

356 Columbia Law School, "Climate Deregulation Tracker."

administration, Trump eliminated six orders that shaped federal, and thereby state, direction and performance objectives for climate mitigation and guidance.[357] In his fifth month, he withdrew the United States from the Paris Agreement.[358] In his eighth month, a critical executive order for flood adaptation was also rescinded; ironically, this happened two weeks before a string of hurricanes decimated parts of Texas, Florida, the U.S. Virgin Islands, and Puerto Rico.[359] There is also concern about how the Trump administration will handle the much-awaited update of the National Climate Assessment. The 2014 National Climate Assessment is a deeply researched report that comprehensively captures the impacts of U.S. climate threats—both today, and in the future.[360] Over 300 specialists and a federal committee of 60 participants, including world-renowned climate experts, developed the assessment, which is due to be updated every four years. It is compiled and hosted by the U.S. Global Change Research Program, which was initiated by the Obama administration. The draft update has been submitted to the White House and is currently awaiting issue amid public concerns that the integrity of the science will be amended by the presidential administration.[361]

Meanwhile, the United States does not have a codified national climate adaptation policy. The closest the United States has gotten to a national agenda on climate adaptation was Obama's Executive Order 13653, that called for the Interagency Climate Change Adaptation Task Force and required federal agencies to submit climate adaptation plans, as previously mentioned.[362] Most agencies complied. However, since the United States is no longer a signatory on any climate agreement, there is no baseline from which the nation

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357 Madison Park, "6 Obama Climate Policies That Trump Orders Change," CNN, March 28, 2017, http://www.cnn.com/2017/03/28/politics/climate-change-obama-rules-trump/index.html.

358 Merica, "Trump Changes U.S. Approach to Climate Change."

359 Barack Obama, *Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects*, Executive Order 13807 (Washington, DC: Executive Office of the President, 2017), https://www.federalregister.gov/documents/2017/08/24/2017-18134/establishing-discipline-and-accountability-in-the-environmental-review-and-permitting-process-for.

360 USGCRP, "National Climate Assessment."

361 Lisa Friedman, "Scientists Fear Trump Will Dismiss Blunt Climate Report," *New York Times*, August 7, 2017, https://www.nytimes.com/2017/08/07/climate/climate-change-drastic-warming-trump.html.

362 Obama, *Preparing the United States for the Impacts of Climate Change*.

can build a framework that is in harmony with international agreements. While Congress recognizes that the response and recovery costs from increasingly frequent and destructive natural disasters places an unsustainable economic burden on the American taxpayer, they have mostly side-stepped any legislation that might improve outcomes.[363] Singularly, the Senate and House Representatives condemn their own lack of action.[364] Meanwhile, the clock keeps ticking faster as the United States, a global superpower, makes no commitment to address the global security threat posed by changes in the climate.

Given these complex struggles, it is worthwhile to explore how other developed nations are adapting to escalating climate impacts and their national security threat. Members of the European Union, Canada, and several Asian nations are actively developing and implementing some level of national climate adaptation planning. In 2010, a national adaptation planning process was created for lesser-developed countries through the UNFCCC.[365] The process includes guidelines, research data, and materials, among other incentives.

B. THE EUROPEAN UNION

Although it has existed since the 1950s, the European Union was officially established in 1993, following nearly fifty years of trade agreements and the European Economic Community. Encouraged to unify for global competitiveness, member states grew in number; following the destruction of the Berlin Wall in 1989, more countries joined as a symbol of European unification.[366] A unitary currency, the euro, was established for economic harmony. Primary objectives of the union are seamless transportation of commodities, services, people, and money, and ensuring environmental protection and

363 Disaster Mitigation Act of 1999, 106 Cong. 2, S. Rep. No. 106-295 (2000), https://www.congress.gov/106/crpt/srpt295/CRPT-106srpt295.pdf.

364 U.S. Senate, "Senators Call Out Web of Denial."

365 "National Adaptation Plans," UNFCCC, accessed July 16, 2017, http://unfccc.int/adaptation/workstreams/national_adaptation_plans/items/6057.php.

366 "The History of the European Union," last modified May 7, 2017, https://europa.eu/european-union/about-eu/history_en.

cohesive international security.[367] Today, the European Union has twenty-eight member states. However, the United Kingdom is preparing to withdraw from the European Union, thereby reducing the number of participating member states to twenty-seven.[368] How problematic this turns out to be is of considerable concern for the greater European Union because the United Kingdom is a vital piece of the EU framework, especially as a leader of the climate program.[369]

The 1997 Kyoto Protocol was the flagship initiative that drove the EU climate program, leveraging obligatory "common coordinated policies and measures" (CCPMs) for member states.[370] Individually, member states must pass complementary laws and policies across economic sectors, including resilience policies. A triadic approach—the Kyoto Protocol, CCPM, and membership codification—solidifies a unified and progressive path.[371] The European Union has equally declared climate change impacts a threat to its national security. Concerns surround increased hostilities, sustenance uncertainties, abuse of international markets and commodities trading, and surges of mass migration.[372] Questions have arisen over realignment of defense and security, shifts in economic stability, civil unrest in and around the EU countries, and stability of authority.[373] It is known that nearby regions already experiencing fragile leadership or economic strength will be most at risk for disruption by climate change and least able to adapt. Regional pressures on the European community will increase as climate change becomes intolerable for locations ravaged by drought or other escalating climate impacts, leaving these areas uninhabitable. For example, by 2025, almost 1.5 billion people will experience

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367 European Union.

368 Alex Hunt and Brian Wheeler, "Brexit: All You Need to Know about the UK Leaving the EU," BBC News, June 27, 2017, http://www.bbc.com/news/uk-politics-32810887.

369 Carlarne, *Climate Change Law and Policy*, 217.

370 Carlarne, 245.

371 Carlarne, 245.

372 Youngs, *Climate Change*, 1.

373 Youngs, 3.

crop failures and 2 billion people water shortages.[374] This is just one example of resource sensitivity that will trigger multiple conditions that affect all world populations.[375] While EU climate impacts are similar to the United States', the manifested threat is different.

Within the last few years, climate security has become more integrated into the larger EU security posture. The European Union is primarily concerned with the external threats that will manifest over time, rather than internal strife and resource depletion. Its collective traditional course has been through soft power and multilateralism; however, there is a perception that the union is shifting toward a more defensive posture.[376] Indeed, the European Union has taken an international leadership role in the climate agenda.[377] Over time, this acceptance of responsibility for science, data, coordination, and representation has led to adaptation policies.[378] The union's members have unique yet tangentially shared histories and ancestries. In an effort to leverage their combined strength, they have come together on shared priorities, democratic governance, security concerns, and other matters that serve to strengthen their geo-strategic unity. Their strength is supported through expertise and regulatory principles.[379] Rule of law is the priority for EU member nations, along with commitment to agreements—including climate initiatives.[380] This means that signatories are bound by their agreement to enter into a membership relationship. That is not to say internal tension is absent; differences of opinion and differences of outcomes exist and are respected within the rule of law.[381] However, the shared membership lends itself to cooperation, and the nations work together on common threats. Unlike the United States, the European Union has not built a robust

374 Youngs, 9.

375 Youngs, 9.

376 Youngs, 1–6, 21–31.

377 Carlarne, *Climate Change Law and Policy*, 191, 238.

378 Carlarne, 189–191.

379 Carlarne, 192–193.

380 Carlarne, 193.

381 Carlarne, 253–254.

emergency management response and recovery agency to address natural hazards.[382] Although they might, therefore, be lagging behind in preparedness to respond to natural hazard events, the military strategy has recognized the future of defense may well include climate-related events.[383]

The European Union adopted a climate adaptation strategy in 2013, which recognizes member nations' vulnerability to climate impacts.[384] By 2050, their research warned, as many as 90 thousand deaths could be attributed to climate impacts in the European Union alone, with an estimated annual cost of €250 billion annually.[385] Currently, fifteen member states are initiating and implementing their own national adaptation strategies. The EU approach fosters sharing of best practices and peer pressure among member states to engage in adaptation measures. Individually, the United Kingdom has initiated numerous projects, including climate change risk assessments and a national adaptation plan, as well as climate resilience toolkits for businesses. Sweden and the Netherlands have focused on flood events.

C. CANADA

Much like the United States, Canada has a colorful history with the climate change issue. Stephen J. Harper was the Canadian prime minister from 2006 to 2015. A member of the Conservative Party, Harper was not a believer of climate threats, or climate change; in the first five years of his administration, over 2,000 government scientists were released and scores of high-profile research programs eliminated.[386] Most cutbacks were felt in environmental programs, such as those focusing on hazardous materials contamination incidents, food inspections, pollution, clean water, and climate change. Harper was controversial for his willingness to avoid transparency—to the point of draconian

382 Youngs, *Climate Change*, 81.

383 Youngs, 80.

384 Youngs, 80.

385 Youngs, 81.

386 Julia Sisler, "Research Cutbacks by Government Alarm Scientists," CBC News, January 10, 2014, http://www.cbc.ca/news/technology/research-cutbacks-by-government-alarm-scientists-1.2490081.

measures. He placed gag orders on government employees, prohibiting them from interacting with the media, and drained science libraries of historical data.[387] By 2011, Harper had withdrawn from the Kyoto Protocol, emphasizing that the United States emits 20 percent of global pollutants and yet was not a participant of the protocol.[388] In 2013, demonstrators across the country demanded transparency and for Canada to "stand up for science in the public interest."[389] Citizens were beginning to see fish mutations and pollution in surrounding watersheds and, not incidentally, the Alberta oil sands were in full swing.[390] While oil sands production was 1 million barrels per day in 2004, it increased to 2.5 million by 2017; Harper had backed economic development to extract the oil from the tar sands, despite environmental consequences.[391]

On November 4, 2015, Justin Trudeau was sworn as Canada's 23rd prime minister. A member of Canada's Liberal Party, Trudeau would become a committed partner with the United States and Obama.[392] In a reversal of current U.S. politics, the Trudeau administration is now dismantling the Harper-era's extreme economic-based agenda. Agreeing to the Keystone XL Pipeline, Trudeau is aggressively pursuing a climate change agenda for adaptation and mitigation. One year after Trudeau's election, on November 4, 2016, Canada officially became a full party to the Paris Agreement.[393] However, it has yet

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387 Sisler.

388 "A Climate Change Plan for the Purposes of the Kyoto Protocol Implementation Act 2012: Canada's Withdrawal from the Kyoto Protocol," Environment and Climate Change Canada, last modified June 19, 2013, https://www.ec.gc.ca/Publications/default.asp?lang=En&n=EE4F06AE-1&xml=EE4F06AE-13EF-453B-B633-FCB3BAECEB4F&offset=3&toc=hide.

389 "Stand Up for Science Rallies Target Federal Government," CBC News, September 16, 2013, http://www.cbc.ca/news/technology/stand-up-for-science-rallies-target-federal-government-1.1855977.

390 Sisler, "Research Cutbacks."

391 Sisler; Dan Healing, "Alberta Oilsands Production Outlook Bright Despite Gloomy Headlines," CBC News, March 19, 2017, http://www.cbc.ca/news/canada/calgary/alberta-oilsands-production-bright-outlook-1.4031788.

392 Jeremy Deaton and Mina Lee, "A Brief History of Canada's Stunning About-Face on Climate Change," ThinkProgress, March 9, 2016, https://thinkprogress.org/a-brief-history-of-canadas-stunning-about-face-on-climate-change-4e7bd921077f/.

393 "Paris Agreement—Status of Ratification," UNFCCC, accessed September 29, 2017, http://unfccc.int/paris_agreement/items/9444.php.

to be seen how he will balance Canada's carbon-rich oil industry with a progressive climate action stance.

Meanwhile, the government of Canada has developed the Pan-Canadian Framework on Clean Growth and Climate Change, and the Federal Adaptation Policy Framework for Climate Change.[394] The framework clearly delineates the federal role in climate adaptation and when it is fitting for the federal government to act.[395] In addition to this comprehensive documentation of the country's approach to mitigating human activity that contributes to climate change, the framework also addresses climate resilience and adaptation in collaboration with provinces, territories, and the private sector. Key focal points for adaptation include establishment of a national climate services center for authoritative, scientifically backed information. Additionally, the federal government is taking a leadership role in building local capacity to incorporate adaptation planning, infrastructure investment, enhanced building codes, health concerns, and special interest in areas at increased geographic risk and vulnerability.[396] The country has developed comprehensive public information websites, too, that discuss the steps the nation is taking for climate adaptation. Climate impacts of concern include the Arctic area, as well as adaptation for indigenous peoples in the far north and shoreline areas. According to Canadian data, over 70 percent of the Canadian shorelines are demarcated by Arctic ice.[397] Climate impacts in these areas are already being observed and will change key survival tactics depended upon for generations.

Canada has found value in focusing on public engagement and climate-resilient building codes; the country is implementing infrastructure improvements, such as increasing snow, ice melt, and storm-water runoff capacity in the city of Winnipeg, which

394 "The Pan-Canadian Framework on Clean Growth and Climate Change," Government of Canada, last modified January 25, 2017, https://www.canada.ca/en/services/environment/weather/climatechange/pan-canadian-framework.html; "Federal Adaptation Policy Framework."

395 Government of Canada, "Federal Adaptation Policy Framework."

396 Government of Canada, "Pan-Canadian Framework."

397 Government of Canada, "Adaptation and Climate Resilience."

is predicated to save more than $40 billion in flood-related disasters.[398] Coastal efforts are underway to employ land-use strategies informed by risk assessments completed with engineering techniques, and natural resource management to reduce risk and increase capacity and resilience. The federal government is also working with local landowners to restore drained wetlands to provide natural flood control and drought protection under the banner of climate adaptation.[399] In 2017, the government developed the Working Group on Adaptation and Climate Resilience, which is drafting a comprehensive report on the nation's ability to adapt and be resilient as the climate changes.[400] If the United States can find a center point, there is much to learn from the Canadian model, especially when it comes to engaging the country's citizens.

In summary, important nations in the Global North, and around the world, accept that climate adaptation is becoming increasingly necessary. Adaptation of the human environment to climate extremes requires understanding of what scientific extremes can mean in terms of impact and destructive forces on that environment. While many extreme events may be similar in nature, each nation has unique characteristics and capacity to adapt their societies and governments to include climate extremes. The United States is no different. As a nation by which rule of law is the backbone of civil society, the United States is well suited to encourage climate adaptation through modifications of existing laws ranging from source point challenges to incentives through government programs and grants, including the Robert T. Stafford Act.

398 Government of Canada.

399 Government of Canada.

400 Government of Canada.

VII. ANALYSIS AND CONCLUSION

> All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident.
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> —Arthur Schopenhauer[401]

This thesis has provided an opportunity for discovery of critical elements that frame societal resilience to the impacts of a changing climate. In doing so, it has discussed climate change drivers and their impacts, including the cascading effects that render the climate a national security threat. It has also explored the importance of the personal convictions and leadership of U.S. presidents in framing a national narrative over the last several decades, and has examined specific U.S. laws and policies that affect national resilience to climate impacts, as well the United States' progress on climate adaptation as it compares to other peer nations. These viewpoints provide a foundational response to the research questions that illustrates the dichotomous and complex discussion surrounding climate change and adaptation. This chapter analyzes this discussion through the filter of the three research questions.

A. RESEARCH QUESTION 1: NATIONAL SECURITY CONSIDERATIONS

> *Is the U.S. government placing the American public at risk by failing to create resilience standards appropriate to the threats posed by natural hazards, including hazards that will be exacerbated by climate change?*

The research produced and discussed in this thesis demonstrates that the United States is not doing enough to safeguard the public against the encroaching effects of climate change. The intelligence community and the Defense Department have publically shared their concerns about the immediate and future impacts of climate change on our national security.[402] But, this is not happening under our current administration. In a September

401 "Arthur Schopenhauer Quotes," BrainyQuote, accessed August 14, 2018, www.brainyquote.com/quotes/arthur_schopenhauer_103608.

402 DoD, "National Security Implications"; National Intelligence Council, "Implications for U.S. National Security," 6–11.

2016 address at the Intelligence & National Security Summit, Director of National Intelligence James R. Clapper stated his belief that climate change will be "an underlying meta-driver of unpredictable instability."[403] He spoke about security concerns exacerbated by climate change, including basic human necessities such as availability of food and water.[404] The Department of Defense and the National Security Council, too, have released independent reports on the climate change threat to the United States, which includes homeland threats evolving from global impacts.[405] These reports discuss national security concerns over the future stability of food and water, coastal risk to sea-level rise, the frequency and intensity of natural disasters, international instability aggravated or triggered by climate, and fundamental human security.[406] DHS also issued statements of concern about America's aging infrastructure, seasonal growing climates, and the impact from the Arctic opening to sea traffic.[407] Climate change, a critical concern in the most recent DHS *Quadrennial Homeland Security Review*, is seen as an enabler for terrorism, legal and illegal migration, natural disasters, and health risks from emergent diseases, such as West Nile virus.[408]

The climate security threat to the United States is real; while they may not be consistently apparent, over time, threats are emerging.[409] Scientists postulate that the faster emissions can be curbed, the more likely it is that the climate can stabilize and we may

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403 James R. Clapper, "DNI Clapper's As Delivered Remarks at the 2016 INSA & AFCEA Intelligence & National Security Summit," Office of the Director of National Intelligence, September 8, 2016, https://www.dni.gov/index.php/newsroom/speeches-interviews/speeches-interviews-2016/item/1627-dni-clapper-s-as-delivered-remarks-at-the-2016-insa-afcea-intelligence-national-security-summit.

404 Clapper.

405 DoD, "National Security Implications."

406 DoD, 3.

407 DHS, *2014 Quadrennial Homeland Security Review*, 22.

408 E. A. Gould, and S. Higgs, "Impact of Climate Change and Other Factors on Emerging Arbovirus Diseases," *Transactions of the Royal Society of Tropical Medicine and Hygiene* 103, no. 2 (2009): 109–121, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2915563/.

409 "Climate Change: How Do We Know?," NASA, accessed October 15, 2017, https://climate.nasa.gov/evidence/.

avoid the most extreme climate impacts.[410] Scientists are concerned that Earth's elevated temperatures will reach a tipping point, setting in motion a feedback loop that reinforces extreme weather events that cannot be easily reversed.[411] According to the National Oceanographic and Atmospheric Administration (NOAA), the last three years set new warming temperature records in a consecutive string of twenty-one years above average.[412] NOAA's global temperature assessment of the first six months of 2018 has already showed it is the fourth hottest year on record.[413] Over a thousand scientists around the world anticipate local temperatures to increase 2.5 to 10° F during the twenty-first century.[414]

Climate events are already increasing worldwide, not just in the United States.[415] In fact, the United States has experienced fewer extreme climate events than other regions. It has become an issue of risk tolerance, data, and resources, and using that information to adapt by creating thresholds of tolerance to offset the risk.[416] This simple concept is unfortunately complex to achieve, and the worldwide and domestic impacts matter to the national security of the United States.[417] For example, climatologists speculate the Earth will experience more intense rain caused by the greenhouse effect.[418] They cannot say how much rain will fall in a given location, but we are seeing that traditional rain patterns may change, evidenced by recent disasters in the United States such as two significant rain events in Louisiana in 2016 and Hurricane Harvey in Texas in 2017. Both events were

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410 T. W. Crowther et al., "Quantifying Global Soil Carbon Losses in Response to Warming," *Nature* 540 (December 2016): 107, http://doi.org/10.1038/nature20150.

411 "The Study of Earth as an Integrated System," NASA, accessed October 15, 2017, https://climate.nasa.gov/nasa_science/science/; Mark Kinver, "Earth Warming to Climate Tipping Point, Warns Study," BBC News, November 30, 2016, http://www.bbc.com/news/science-environment-38146248.

412 "National Climate Report—Annual 2017," NOAA, January 12, 2018, www.ncdc.noaa.gov/sotc/national/201713.

413 "Global Climate Report," NOAA, June 2018, https://www.ncdc.noaa.gov/sotc/global/201806.

414 "The Consequences of Climate Change," NASA, accessed October 17, 2017, https://climate.nasa.gov/effects/.

415 NASA.

416 Busby, *Climate Change and National Security*, 9.

417 President of the United States, *National Security Strategy*.

418 NASA, "Consequences of Climate Change."

unusual for the volume of rain and the persistence due to stalled movement. Combined with higher temperatures, drought extremes will also emerge in areas accustomed to receiving replenishing rains. As the soil becomes increasingly dry, wildfires will rage and other areas will experience unlivable periodic torrents. As a result, people will migrate.

Coastal areas everywhere are experiencing harsher living conditions. Sea-level rise, storm surges, and subsidence are causing increased erosion and road and sewer flooding (e.g., in Miami), and will soon allow water into first-level buildings. Saltwater intrusion into freshwater aquifers will also result as tides creep higher. The economic impact, including to real estate, can be huge if infrastructure is not adapted to accommodate these changing conditions.[419] Furthermore, traditional agricultural areas may become too hot or dry, and the growing seasons may become shorter or longer. This will push food crops further north, or cause the land to lose its entire flora and fauna species, which will be unaccustomed to the new growing conditions.[420] Similarly, polar ice melt is creating new fishing, drilling, and shipping lanes. This opens worrisome potential for conflict over land rights with native peoples and other countries willing to militarily defend their claim.

Today, the United States treats each disaster event as though it is a single, unrepeatable event. When treated in isolation, each event focuses only on policy, regulation, and securing taxpayer funds to repair the damage. When the next event occurs, the same formula is applied. This approach does not build deliberate resilience capacity over time. Climate adaptation should be an all-systems approach that views the scope of the problem from a broad, long-term view. The U.S. posture and strategy for handling these events must be clear, robust and committed.[421]

The U.S. intelligence community, Department of Defense, and a consortium of retired military leaders have pronounced that climate change is a national security threat; it therefore deserves focused attention and leadership. Yet, it is not occurring in the current

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419 Krishna Rao, "Climate Change and Housing: Will a Rising Tide Sink All Homes?" Zillow, June 2, 2017, https://www.zillow.com/research/climate-change-underwater-homes-12890/; Parenti, "If We Fail."

420 NASA, "Consequences of Climate Change."

421 Busby, *Climate Change and National Security*, 27.

administration. Nor is there a path toward addressing these concerns from a congressional or executive level. The United States has not maintained a consistent and committed path to safeguard the American public from the impacts of climate change. For decades, the United States has avoided national commitment to a climate change science, mitigation, and adaptation.[422] If there were ever a time to incentivize a nation to action, it is now.

B. RESEARCH QUESTION 2: DISHARMONY OF LAWS, REGULATIONS, AND POLICIES

What is preventing the nation from understanding the risk of climate security threats, and the need to adapt to those threats?

There are many complex impediments preventing the United States from adopting higher risk awareness to climate change. The politicized nature of the problem prevents sustained steps toward national adaptation. Political leadership must be unified on the science in order to move the nation toward comprehensive planning and actionable changes, which must come from laws and policy that enable resilience. Currently laws and policy that frame emergency management, building codes and housing development, land use, and even federal investment in infrastructure do not have guidance on climate change adaptation. Yet these sectors play a critical role in any attempt to seek climate resilience. An evaluation of effectiveness should determine if these laws and policies promote a system that condones minimum performance standards in the face of intensifying threats.

In the recent past, the Obama administration set the United States on an achievable track comparable with other Western nations' efforts by providing goals and milestones.[423] More importantly, the administration built a foundation of interagency teamwork at the White House to increase the scope of climate adaptation accomplishments.[424] However, a significant gap between federal and state support persists; action from Congress is needed

422 Carlarne, *Climate Change Law and Policy*.

423 John Kerry, "President Obama's Memorandum on Climate Change and National Security," U.S. Department of State, September. 21, 2016, https://2009-2017.state.gov/secretary/remarks/2016/09/262250.htm.

424 Obama, *Preparing the United States*.

to provide state incentives and assistance on climate adaptation progress.[425] Meanwhile, several states and some municipal governments recognize the seriousness of climate threat and its future impacts. Fourteen states completed climate change adaptation plans, and some are making excellent progress to include sustainability in their growth and development choices.[426]

Some private-sector and non-governmental organizations are coming forward with incentives to help major cities embrace sustainability, and to demonstrate progress and show leadership where otherwise there is none. The Rockefeller Foundation's "100 Resilient Cities" competition is one such initiative.[427] The twenty-two U.S. cities participating in this challenge will receive significant grant funds and planning support to increase their capability for sustainable projects.[428] In 2014, Obama also sponsored the $1 billion National Disaster Resilience Competition, in which sixty-seven disaster-impacted jurisdictions competed to share special public–private partnership assistance through the Department of Housing and Urban Development's block grants.[429]

Yet the political debate struggles to reveal whether mitigating impacts before the onset of severe consequences is economically beneficial.[430] It is becoming increasingly relevant to address steps toward informed climate change adaptation, at a minimum. Political unity is important because it is the nexus where decision making and support will occur. If constituents cannot support a decisive course of action, the collective way forward will be more complex; laws will struggle to be passed and national cohesiveness on a critical issue—both today and for future generations—will suffer. While any forward

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425 Jane A. Leggett, *Climate Change Adaptation*.

426 Aaron D. Ray and Jessica Grannis, "From Planning to Action: Implementation of State Climate Change Adaptation Plans," *Michigan Journal of Sustainability* 3 (Spring 2015), http://dx.doi.org/10.3998/mjs.12333712.0003.001.

427 100 Resilient Cities, accessed October 11, 2017, http://www.100resilientcities.org/.

428 100 Resilient Cities.

429 "National Disaster Resilience Competition," Rockefeller Foundation, accessed October 17, 2017, https://www.rockefellerfoundation.org/our-work/initiatives/national-disaster-resilience-competition/.

430 Busby, *Climate Change and National Security*, 4.

momentum is positive for the nation, federal leadership must commit to a path.[431] The dismantling of proficient foundations for progress from president to president illustrates how such important courses can be treated randomly, and not without serious implications to the public.[432]

As the United States is impacted by natural disasters routinely, some impacts are repetitive. Communities remain vulnerable to hazards. When they are situated in unsafe locations, or not built to withstand today's climate, they are certainly not safe for the future climate. Expenses to the federal treasury to rebuild communities that do not incorporate the climate adaptation measures needed to withstand the next event, especially future extreme events, are wasteful.[433] Currently, the Stafford Act does not require applicants to consider future climate models to receive federal emergency assistance or public assistance.[434]

For example, a bridge washes out from torrential rains or unprecedented storm water runoff from a sudden rain bomb. The area receives a presidential disaster declaration and authorized use of the Stafford Act. For the public assistance program to repair or replace public infrastructure, the Stafford Act requires determination on cost of repairs not to exceed 50 percent of the cost of replacement to pre-disaster condition.[435] As previously established, there is no requirement to use forensics to determine the capacity necessary to withstand another similar event, or consideration of future modeling to offset for climate extremes. The only requirement is that the repair or replacement will be conducted to pre-disaster condition and the only potential resilience boost will be using current local codes.

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431 Carol Morello and John Wagner, "As the U.S. Leaves Paris Climate Accord, Some See Shifts in Global Leadership," *Washington Post*, June 1, 2017, https://www.washingtonpost.com/world/national-security/as-the-us-leaves-paris-climate-accord-some-see-shifts-in-global-leadership/2017/06/01/4c916554-4634-11e7-a196-a1bb629f64cb_story.html?utm_term=.dc6f60051d62.

432 "Regulation Database—Executive Orders," Columbia Law School, accessed October 16, 2017, http://columbiaclimatelaw.com/resources/climate-deregulation-tracker/database/executive-orders/#13690; Chris Amico and Anjali Tsui, "How Scott Pruitt's EPA is Erasing Obama's Climate Change Legacy," PBS, October 11, 2017, http://www.pbs.org/wgbh/frontline/article/how-scott-pruitts-epa-is-erasing-obamas-climate-change-legacy/.

433 Busby, *Climate Change and National Security*, 26.

434 Stafford Act § 406; Restoration of Damaged Facilities, 44 C.F.R. § 206.226 (2017).

435 Federal Disaster Assistance, 44 C.F.R. § 206.22(f)(1) (1989).

Should the community wish to have the damaged infrastructure considered for mitigation (to make it bigger, better, stronger), it must ask the FEMA caseworker to provide consideration for "406 Mitigation" measures.[436] Most communities do not know to ask, and some state agencies are just now realizing they can. However, it does not always work; 406 Mitigation has challenges within FEMA because it is time consuming and slows down the cadence of the program's get-in, get-out methodology. It is a problem for communities that want to leverage federal assistance to offset future damages. While Obama issued the Federal Flood Risk Management Standard (FFRMS)—which did exactly that—the standard was not codified by law and was one of several policy retractions initiated by the Trump administration in 2017.[437] Congress has not passed a complementary law to protect provisions, even though the states would benefit from such measures. This type of discontinuity overshadows the national urgency and demonstrated need for climate adaptation.

Other policy measures important to national security are the methodologies for land use planning and building code application at the local level. The research for this thesis identified that there are no federal regulations mandating building codes or risk evaluations for land use. Of equal interest is the lack of accountability for those policies in order to receive pre- or post-disaster federal grants. Federal disaster declarations qualify communities for millions, possibly billions, of federal taxpayer assistance without any commitment beyond rebuilding to locally adopted codes and maintaining the infrastructure.[438] Maintenance condition lends itself to a degree of qualitative subjectivity; each structure evaluation can result in a varied determination. Note, too, that although a community may adopt, for example, the International Building Codes, that community also has the authority to *adapt* the codes to its needs or risks. There is no formula for evaluating a degree to which codes can or should be modified to fit the risk profile. In other words,

436 Stafford Act § 406; Restoration of Damaged Facilities.

437 Barack Obama, *Establishing a Federal Flood Risk Management Standard*, Executive Order 13690 (Washington, DC: White House, 2015), https://obamawhitehouse.archives.gov/the-press-office/2015/01/30/executive-order-establishing-federal-flood-risk-management-standard-and-.

438 Stafford Act.

jurisdictions can change the codes without oversight or justification unless a state requirement exists. In the event of a disaster, neither the community nor the state on whose behalf the codes have been locally entrusted is held responsible for the outcome, unless it is obvious the structure was improperly maintained.

The building industry is self-organized into a consortium-like body that provides the professional guidance lawmakers use to draft and write policies. In the case of building codes, there are few governing laws, primarily concerning inclusion of federal agencies for certain standards development when necessary. It is not clear when that would be necessary, or what federal agencies are needed.[439] A syndicate of seventeen industry organizations determines codes, and reviews and replaces them every three years.[440] The Government Accountability Office's November 2016 performance audit for climate change clearly shows that the consortium participants find integration of climate science troublesome and irregular.[441] The consortium also acknowledged local communities determine their own risk to hazards and choose the level of resilience measures through adaptive building codes.[442] Recall that there is no further oversight on the strength or resilience of the homes built in America today.

While affordability has been a repeated impediment to sustainable construction, the costs do not appear to be significant enough to offset the benefits.[443] Home prices are driven by local markets and are not significantly impacted by safety or resilience.[444] Most homebuyers are unaware of the differences in local codes and enforcement commitments. Purchasing a home should not be a gamble. Low-income residents are particularly vulnerable and have the least resources to invest in recovery; put another way, low-income

439 GAO, *Climate Change,* 28.

440 GAO.

441 GAO.

442 GAO, 29.

443 Papadopoulos, *Resilience*, 63.

444 Papadopoulos, 63.

sectors benefit the most from strong codes to offset future losses.[445] When neighborhoods are destroyed, the impacts run deeper than just the cost or the disruption to the homeowner as he or she replaces the—though both are significant. But the impacts also displacement, cleanup, landfill, loss of infrastructure, and other costs that average approximately $100,000 per building (in 2014 dollars), costs shouldered by the American taxpayer on behalf of "the U.S. government."[446]

As this reflection points out, the average American believes the government provides safety nets through the passage and implementation of equitable laws and policy. The minimum standards of building codes, land use policy, and even some emergency management policies are no longer sustainable to the climate threat. This should be a problem of accountability: laws and policies are not serving the best interest of consumers or the nation's capacity for resilience to a known national security threat. Minimum standards should be continually rated to the climate threat for effectiveness, rather than for tolerance for the lowest possible allowance. We must remember, as well, that national leadership is needed to put the nation on a path toward resilience. The threat of climate change requires clear thinking and collaboration among national leaders. Although regulatory guidance is unpopular in American politics today, in the case of climate change adaptation it is a necessary power. Laws and policies must recognize the depth of the problem, and be accordingly modified. National action is necessary, and it must come through a systemic, unified response to the key drivers that enable knowable, and preventable, vulnerabilities.

C. RESEARCH QUESTION 3: UNIVERSAL INDEPENDENCE TO A COLLECTIVE PROBLEM

What lessons can the United States learn from our allies to establish an effective climate change adaptation protocol?

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445 "Planning for Post-disaster Recovery Briefing Papers," American Planning Association, accessed October 16, 2017, https://www.planning.org/research/postdisaster/briefingpapers/housing.htm.

446 Papadopoulos, *Resilience*, 64.

Our allies, namely the European Union and Canada, have internalized a committed path toward climate adaptation and resilience. They recognize the threat that climate change poses to their national security and are taking steps to adapt their societies to its impacts. To face the threat, they have adopted a risk-based culture of decision-making and have been transparent about the threat with their citizens. They have websites up and running with consumer-friendly information about the status of climate adaptation. Furthermore, EU member nations, Canada, Latin America, and some African and Asian nations are actively developing and implementing national climate adaptation planning. The national adaptation planning process—which the UNFCCC created in 2010 for lesser-developed countries—includes guidelines, research, data, materials, and incentives.

The common denominator is transparency, and proclaimed political commitments to climate change adaptation. The United States, European Union, and Canada each has informative websites; the U.S. Global Change Research Program website (GlobalChange.gov) is a first-rate web platform, and Canada and the European Union have enabled similar, if not as robust, public-facing websites. In the United States, however, unlike in the other regions, there is little effort to shape the culture toward risk-based decision-making. Risk-based decision making considers growth, development, and risk-tolerance against extreme weather. Considerations include capacity for disaster response, recovery, and economic factors that will be affected by climate change. FEMA's concept of hazard mitigation planning could offer a path for improvement.[447] As with many federal programs, FEMA's hazard mitigation planning it is an incentive program that encourages communities to prepare for hazards and qualifies them to participate in certain grant programs.[448]

The European Union is not immune to some of the same natural hazards as the United States, including human-caused and technological concerns, though they may not share all of the same risks. According to the European Commission, the European Union

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447 FEMA, *Local Mitigation Plan Review Guide,* October 11, 2011. https://www.fema.gov/media-library-data/20130726-1809-25045-7498/plan_review_guide_final_9_30_11.pdf.

448 Mitigation Planning, 44 C.F.R. § 201.3(c)(1), §2 04.51(d).

expended €100 billion (approximately $120 billion) in disaster funds during an eleven-year period from 2005 through 2016.[449] The top EU hazards are flooding and extreme weather, closely followed by forest fires.[450] The European disaster risk management community indicates that climate change is influencing stronger and more frequent disasters.[451] In the United States, disasters during the period from 1980 to 2013 cost more than $1.07 trillion; Hurricane Katrina in 2005 was the most expensive disaster (at a cost of $196 billion), and Hurricane Sandy in 2012 was also notable ($65.7 billion).[452] During the same time period, drought and hurricanes comprised more than $768 billion in losses.[453] Cumulatively, 2017 will likely be the costliest year for U.S. disasters in history.

Canada also shares similar hazards with the United States. As in the United States, flooding is the most common, and expensive, hazard in Canada.[454] However, landslides and earthquakes occur more frequently. A report from the Canadian Parliamentary Budget Officer acknowledges that climate change is a likely factor influencing the severity of weather events in Canada.[455] The report predicts that winter storms will triple, and that between 2016 and 2020 annual flood costs will double ($673 million) over the previous five-year period (2011 to 2015). The budget officer report claims lack of coordination with the United States has negatively affected flood-related incidents and increased costs of

449 "Funding Opportunities for Disaster Risk Management within EU Cohesion Policy," European Commission, last updated October 2016, http://ec.europa.eu/regional_policy/en/policy/themes/climate-change/funding-risk-prevention/.

450 "Overview of Natural and Man-Made Disaster Risks the European Union May Face," European Commission, May 23, 2017, http://ec.europa.eu/echo/sites/echo-site/files/swd_2017_176_overview_of_risks_2.pdf.

451 "European Civil Protection and Humanitarian Aid Operations, Disaster Risk Management," European Commission, accessed October 16, 2017, http://ec.europa.eu/echo/files/aid/countries/factsheets/thematic/disaster_risk_management_en.pdf.

452 Brusentsev and Vroman, *Disasters in the United States*, 45.

453 Brusentsev and Vroman, 45.

454 "Natural Hazards," Government of Canada, accessed October 16, 2017, www.canada.ca/en/services/policing/emergencies/hazards.html.

455 "Estimate of the Average Annual Cost for Disaster Financial Assistance Arrangements Due to Weather Events," Office of the Parliamentary Budget Officer, February 25, 2016, http://www.pbo-dpb.gc.ca/web/default/files/Documents/Reports/2016/DFAA/DFAA_EN.pdf.

disasters.[456] While the United States and Canada experience more frequent and more expensive climate-related losses than the European Union, both the Canadian and European Union estimates for disaster losses are escalating now, not in the distant future.

The United States is a nation of laws—as are the European Union and Canada. The European Union, however, has conditional membership and its agreements are binding.[457] Member-state cooperation is secured upon joining, and members participate in climate strategies. The U.S. Constitution predates the European Union, and it predates climate issues. U.S. states enjoy a level of home-rule autonomy in this regard. To develop an EU-type climate model, states must be incentivized or rules codified by law. Thus, the recommendations in the next chapter may seem draconian in a period of deregulation.

D. CONCLUSION

The United States is fortunate to have the wealth and capability to wrestle with the implications of climate change, and to address the adaptation issues raised in this thesis. In doing so, the country must recognize the importance of rule of law, long-term vision (beyond election term limits and election cycles), the value of a national dialogue, and decisive action toward reducing the national threat to increasing weather extremes. However, the path toward solutions in the interest of national security is troubling. The urgency of the problem is not being met with the leadership needed to make reasonable solutions actionable.

Accountability is a key gap. The United States fosters an individualistic lifestyle, which is increasingly permeating our governance and culture—independence and individualism in this lifestyle become misleadingly synonymous. If the new norm in American culture is to preserve the misnomer of "independence" (individualism) at the expense of others, most especially the greater good, the climate issue becomes problematic. Although the purpose of this thesis is not to analyze individualism and community dynamics, it is important to recognize the significant influence this concept may have in

456 Parliamentary Budget Officer, 26.

457 "European Union Climate Adaptation Strategy," European Union, last modified May 7, 2017, https://ec.europa.eu/clima/policies/adaptation/what_en.

distracting the United States from a reasonable climate discussion. Accountability is further challenged by election cycles, which may have a disproportionate influence on the climate discussion. Climate adaptation is not amenable to the short-term fixes that are compatible with U.S. election cycles. However, congressional and executive committees are developed on important issues at all levels of government and engage transitioning members, regardless of political influence or term limits. A committee system is needed for climate science and long-term planning for the future of the country and continuity of leadership. This committee would need to advise and collaborate with other federal agencies to address extreme weather and amend public policy on resilience standards. For example, all public infrastructure projects should use minimum standards that include increased intensity based on current and predicted climate science. This may mean reinstating Obama's Executive Order 13690, *Establishing a Federal Flood Risk Management Standard*, and furthering the concept to include all extreme weather risks. Building codes and land use planning must envision changing environments and what the risks mean to the public—to include the individual family—so that citizens are protected as much as the developer and land use planner are. A national risk database is needed to harmonize data and usage, and to enhance communities' risk resilience.

A national conversation about climate is important, but politics are far too infused in the topic. The government must enable honest transparency and engagement. Public programs, national messaging, and guidance should be developed and robustly delivered. Nationally, climate adaptation is under-recognized, as are the devastating and erosive effects of climate change, and their capacity to harm the country. We need intelligent federal policies and actions—in partnership with the federal, state, tribal, territorial, and local governments. This means we need to reimagine what is considered "safe." Images of Puerto Rico following Hurricane Maria are sobering; they show the frightening realm of consequences when a community is deep in debt and living with inadequate, or eroding, infrastructure.

To build resilience at this level, we need action. As a leading superpower with complex dynamics, the nation's security against any threat should not be compromised over one individual's belief. Politics aside, the climate threat is real, it is growing, and it is

devastatingly destructive. Resilience can be achieved, but only with a clear-eyed understanding of the nation's vulnerability and a deliberate process to eliminate the risk.

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VIII. RECOMMENDATION

> Those of us who are privileged to be alive in these early decades of the 21st century are called upon to make decisions of great consequence.
>
> —Al Gore[458]

A. NATIONAL CLIMATE CONVERSATION: CONGRESSIONAL PANEL

Like many topics in the United States today, climate change is a divisive issue among politicians, and equally among citizens. In order to work through this important national security threat at the level it deserves, Congress should enact legislative framework that is independent of political manipulation through a panel of highly qualified science advisers and a range of climate positions. Consensus on climate narrative and actionable processes must be determined on a national scale, as is appropriate to its national security threat. Their focus must be on climate risk reduction to the public through messaging, smart development and growth practices, and codification of mitigation techniques, and a thorough review of existing laws to support preparing the public for climate change. A climate consensus and recommendations for mitigation and adaptation are necessary to defend the nation against this emerging threat. Citizens must be part of the engagement process. Conclusions of this panel must be respected by both houses of Congress and the executive branch and, if necessary, should pass constitutional review. Policy should be developed and codified toward a national resilience and adaptation protocol.

B. NATIONAL RESILIENCE AND CLIMATE ADAPTATION PROTOCOL

The purpose of a national protocol is to provide achievable goals through national policy and guidance to create systemic national resilience for the people to withstand climate extremes.

458 Al Gore. Truth to Power; New York, NY; Rodale Books, 2017, 308.

(1) Organizational Leadership and Authorities

- Create a cabinet-level Department of Climate, Research, and Adaptation (DCRA). The Department is responsible for science data, utilizing existing federal science agencies to create and maintain climate data, modeling, and sharing platforms. This Department will create policy teams to collaborate with all federal agencies for strategic and implementation platforms.
- Create a complementary Congressional Climate Adaptation Oversight Committee.
- Develop and implement a National Adaptation Protocol (key components described in subsection 4).
- Create executive assignment to DHS.
- Implement National Adaptation Protocol through DHS in FEMA, in conjunction with all federal agencies under the National Planning Frameworks (National Preparedness Goal).
- Codify the Federal Food Risk Management Standard (FFRMS) into law.
- Modify FFRMS to include all projects where federal funds are applied, to include climate change mitigation and adaptation through 2100.

(2) Legislative Changes to the Stafford Act (and Amendments) for the Following Programs

- National Adaptation Protocol incentive for all states, territories, tribes and local governments to receive federal assistance.
- Public Assistance (44 C.F.R. § 206.226).
- Section 406 Mitigation to be applied to all public infrastructures.
- Hazard Mitigation Planning (44 C.F.R. § 201).

- National Adaptation Protocol requirements and annual state accountability reviews.

(3) Modify the National Preparedness Goal

- Codified the goal by law.
- Include intensified climate threats utilizing DCRA data and modeling. Require proof of annual adaptation measures implemented through state Hazard Mitigation Plans and quantifiable performance enhancements resulting in response reduction.

(4) Key Components

- Develop National Natural Hazard and Climate Adaptation Risk Database available for nationwide use, for local use in building codes, land use, hazard mitigation, etc.
- Require scientific climate modeling to utilize decadal projections through year 2100, adding one decade for every decade passed, and have this data reflected in Hazard Mitigation Plans.
- Review and modify all Minimum Standards for Building Codes, especially residential-level codes, to withstand reasonable risk to infrastructure from increased all-weather threats.
- In conjunction with the White House Climate Team, create regulatory requirements for building codes above minimum thresholds. Develop national land use regulatory profiles for risk assessments. Provide learning/classes. This will include community and state accountability for sliding scale–type awards for public assistance grants.
- FEMA, in cooperation with Building Code Consortium and state agencies, should develop a historical database and tracking information for all communities, with accessible information for

    - Historical building code mapping for every community. Develop guidelines for code modifications.
    - Provide regulatory oversight of building codes with state agencies.
- Require local accountability of land use and zoning utilizing risk assessments, and mitigate accordingly prior to development.
- Communities must be required to provide insurance policies on any public infrastructure they would repair or replace, or forfeit as self-insured and assume possible loss of the damaged public infrastructure.
- Develop state Risk Awareness and Adaptation Outreach Programs under the Climate Adaptation Oversight Committee to provide staff and allocation to the DCRA for continuity of national messaging and public outreach strategies.
- Incentivize commercial insurers to work closely with the Climate Adaptation Oversight Committee to develop insurance policies that reward risk-conscious consumers based on climate from DCRA. Assist in creating a behavioral culture change in the United States about risk awareness.
- Annually appropriate no less than $1 billion for climate adaptation and resilience initiatives to local jurisdictions (through reduction in annual oil subsidies).

The United States has demonstrated over the course of her short nationhood to be a compassionate leader in times of difficult choices. Choices today will affect generations of Americans and all life on Earth. The U.S. is obligated to protect the citizens of this great nation by setting politics aside and focus on informed decisions. Recognition of impact from past actions is what every private and public sector program must do to remain relevant in today's society. It is no less incumbent upon the U.S. government to do the same for the impacts of climate change. The stakes are higher than ever and require competently focused leadership to do the right things to protect this great nation.

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